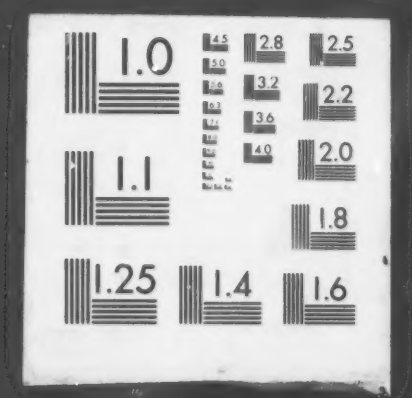
1 OF 1
PB
294363



U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
PB-294 363

Handbook for Preparing Office of Research and Development Reports Revised

Environmental Research Center, Cincinnati, OH

Dec 78

PB 294363

EPA

Handbook for Preparing Office of Research and Development Reports

Revised

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

EPA-600/9-78-032
December 1978

Handbook for Preparing Office of Research and Development Reports

Revised

Compiled by
Technical Information Operations Staff
Environmental Research Information Center

Environmental Research Center
Office of Research Program Management
Office of Research and Development
U.S. Environmental Protection Agency
Cincinnati OH 45268

1a

Disclaimer

This report has been reviewed by the Office of Research and Development, U.S. Environmental Protection Agency, and approved for publication. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

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Acknowledgment

We wish to acknowledge the considerable help and constructive suggestions provided by ORD's Technical Information Coordinators, other key ORD personnel who contributed to this document, and EPA's Office of Administration. Although it was impossible to incorporate all the useful guidance and suggestions provided, we believe that the final specifications contained herein will meet the need of all performing organizations engaged in preparing ORD scientific and technical reports and that these efforts will result in more uniform and higher quality output of which we can all be proud.

BIBLIOGRAPHIC INFORMATION

PB-294 363

Handbook for Preparing Office of Research and Development Reports. Revised.

Dec 78

PERFORMER: Environmental Research Center, Cincinnati, OH.
EPA/600/9-78/032

Supersedes PB-256 800.

This document contains the essential specifications set forth by the Office of Research and Development (ORD) to ensure that the results and conclusions of its various research, development, and demonstration programs are documented and printed in a uniform, high quality, and cost-effective manner. It is specifically intended to assist those individuals responsible for preparing ORD scientific and technical reports by providing consistent format specifications and guidelines for the actual preparation of camera-ready reports.

KEYWORDS: *Technical writing, *Specifications.

Available from the National Technical Information Service, Springfield, Va. 22161

PRICE CODE: PC A03/MF A01

1. Introduction

Purpose

This document contains the essential specifications set forth by the Office of Research and Development (ORD) to ensure that the results and conclusions of its various research, development, and demonstration programs are documented and printed in a uniform, high quality, and cost-effective manner. It is specifically intended to assist those individuals responsible for preparing ORD scientific and technical reports by providing consistent format specifications and guidelines for the actual preparation of camera-ready reports.

Applicability

These specifications and guidelines apply to all final scientific and technical reports that are prepared and/or printed as a result of ORD-sponsored/conducted research. They are to be followed by all EPA research components: the performing organization, the Project Officer, and all key personnel involved in preparing ORD scientific and technical reports. These reports include all final reports that document in-house, interagency, grant, and contract research activities performed by or for ORD; project reports that document the findings of research activities required to produce a specific research output; or special reports that are specifically tailored to meet the needs of defined user groups. Examples of special reports include but are not limited to: criteria documents, state-of-the-art analyses, technology assessments, design manuals for pollution control or decision-making models, test protocols, or any other type of report providing operational or decision-making guidelines.

Exclusions

These specifications and guidelines are not totally applicable for non-technical reports and studies, theses, bibliographies, training manuals, catalogs, administrative or fiscal reports, and manuscripts to be published by other than ORD (e.g., journals or symposia proceedings). Individuals responsible for preparing such reports should contact the Technical Information Operations Staff (TIOS), Environmental Research Information Center (ERIC), Cincinnati OH, for additional guidance and assistance.

Waivers

Any deviation from these specifications must be approved by or through the Project Officer. Project Officers should forward any request for approval of a major deviation through their assigned Technical Information Coordinator to the Technical Information Operations Staff, Cincinnati OH.

Extramural Considerations

Conformance with the specifications contained in this document and the form of submission must be cited in the final extramural agreement (interagency, grant, or contract). When the final report is complete and approved, the performing organization shall submit the reproducible manuscript (and printed copies if so specified) to the assigned Project Officer.

2. General Requirements

This section provides information that is generally applicable to all ORD scientific and technical reports. It identifies important reference documents, applicable legal considerations, and criteria for units of measure.

Sources of Information

The following references are cited as supplemental sources for necessary and helpful information that can be used to prepare ORD scientific and technical reports. Other guides from engineering and scientific societies and journals may be used to the extent that they do not conflict with EPA or ORD specifications.

COSATI Subject Category List, Office of Science and Technology, 1964. The Committee on Scientific and Technical Information's (COSATI) outline for uniformly arranging all subject matter used to complete Block 17c of the Technical Report Data sheet, EPA-2220-1. Each Technical Information Coordinator has been furnished with a copy, and additional copies are available from the National Technical Information Service (NTIS), Springfield VA 22161, as order number AD 612 200.

EPA Graphic Standards System, 1978. A graphic identity system that establishes and delineates the graphic standards which EPA will adhere to in all its visual communications. Copies are available from the Superintendent of Documents, U.S. Government Printing Office, Washington DC 20402, stock number 055-000-00169-3.

Government Printing and Binding Regulations, Joint Committee on Printing, Congress of the United States, No. 24, April 1977. This pamphlet provides background information on Government Printing Office requirements concerning the use of color printing, self-mailers, printing requirements resulting from grants or contracts, etc. Copies are available from U.S. Environmental Protection Agency, Printing Management and Distribution Section, Washington DC 20460.

Metric Practice Guide, ASTM E 380-76. This Guide deals with conversion of quantities in various measurement systems to the International System of Units (officially abbreviated SI in all languages). It is available from the American Society for Testing and Materials, 1916 Race Street, Philadelphia PA 19103.

NTIS Subject Classification (Past and Present): An NTIS Data Base Reference Aid, 1977. The National Technical Information Service subject category schemes used to supplement COSATI in completing Block 17c of the Technical Report Data sheet, EPA 2220-1. Each Technical Information Coordinator has been furnished with a copy, and additional copies are available from NTIS as order number SR-77-02.

Style Manual, U.S. Government Printing Office, Washington DC. This manual contains general editorial advice and the Federal government's recommended style for capitalization, punctuation, use of numerals, hyphenation, etc. It may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington DC 20402.

Thesaurus of Engineering and Scientific Terms, Department of Defense/ Engineers Joint Council. This is a compilation of key words from which the identifiers required to complete Block 17a of the Technical Report Data Sheet, EPA 2220-1, must be selected. Each Technical Information Coordinator has been furnished with a copy, and additional copies are available from NTIS, as order number AD 672 000.

Units of Weight and Measure: International (Metric) and U.S. Customary, L.J. Chisholm, U.S. Department of Commerce, National Bureau of Standards, NBS Misc. Pub. 286, revised October 1972. This document provides definitions and conversion factors from various systems of measurements to the international system. It may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington DC 20402.

Legal Considerations

The Government may be subject to liability for misuse of the literary or intellectual property (patents, trademarks, "proprietary information") of others. Report writers and editors should observe the following guidelines:

Copyrighted, Contributed, or Unpublished Material

Copyrighted material may not be incorporated in a report unless written permission of the copyright owner has been obtained. Prior use of copyrighted material in another government publication does not necessarily constitute permission to use it in an EPA/ORD publication. When permission has been obtained and the material is used in a report, it shall be identified by a statement substantially as follows:

> Reprinted from (title of publication, year of first publication) by (name of author) with permission of (names of copyright owner, if different from that of author).

Unpublished work may be protected under common law or equity, even though there is no copyright notice. Refer problems relating to the protection given to unpublished work to EPA's Office of General Counsel (Washington DC 20460).

Courtesy requires that uncopyrighted materials from, or assistance rendered by, other persons be acknowledged through the use of footnote, bibliographic reference, or statement in the text. Credit lines shall not be given for material purchased by a department; nongovernment designers, typographers, or layout artists; and government art directors, designers, typographers, layout artists, or photographers.

Privately Owned Information

To avoid restricting the availability of a report, make every effort not to use information accepted by the government for limited purposes. Such information will be used only when it is essential to the understanding of a report and only after approval for its use is authorized by the Office of General Counsel. Reports containing such information will bear a statement restricting availability and handling, as required.

Trade Names and Manufacturers' Names

The use of trade names, etc., should be explicitly brought to the attention of the Project Officer and the cognizant approving official before the report is cleared for publication.

Notification of Draft Documents

As a result of provisions contained in the Freedom of Information Act and for other programmatic reasons, draft copies of ORD reports are often distributed outside the Agency. To prevent misunderstanding, the following notice must appear in the top half of the first page of the general text of all draft scientific and technical reports:

Notice

This document is a preliminary draft. It has not been formally released by the U.S. Environmental Protection Agency and should not at this stage be construed to represent Agency policy. It is being circulated for comments on its technical merit and policy implications.

Disclaimer Notice

Select the appropriate disclaimer statement indicated in Sample C of this document. The Disclaimer Notice will always appear on the reverse side of the title page.

Metric Units of Measure

The modernized metric system utilizing the International System of Units (Système International d'Unités, SI) shall be used unless otherwise specified by the Project Officer. Equivalent units may be expressed parenthetically, if desired. If other than metric measures are used, the reason for such use should be footnoted at the first nonmetric measure, and reference should be made to a conversion table included in the report.

3. Format Specifications and Samples

Overview

This section identifies the format specifications to be followed by authors and typists when preparing either draft or final camera-ready copy of ORD scientific and technical reports. It is to be used by others who are responsible for performing format reviews of ORD scientific and technical reports to ensure conformance with these specifications. Within any one report, strive for consistency; there are many acceptable modes for abbreviations, tables, figures, order of headings, etc. A common-sense, consistent approach will usually produce a visually acceptable document. The following paragraphs contain general information and typing guidelines that apply to all sections of the report, an outline of the major elements that usually appear within a report, and a sample of each major element. Each sample also contains specific guidance for the preparation of that element.

Report Organization

In the outline below, the major elements of most ORD scientific and technical reports are itemized. When some or all of the elements occur, they are included in the order shown. The outline also indicates, in the second column, those elements *required* for all reports (*); those elements that, although not required, would appear in most ORD reports (†); and those elements that are included only if needed to enhance communication with the reader or the utility of the report (‡). The third column indicates the sample (found in this volume) that illustrates and gives information about the particular element.

Order of Elements

Element	*How Necessary*	*Sample*
Front Cover		
Front Matter		
Title page	*	B
Disclaimer notice	*	C
Foreword	*	D
Preface	‡	E
Abstract	*	F
Contents	†	G
List of illustrations	†	H
List of tables	†	I
List of abbreviations and symbols	†	J
Acknowledgment	†	K
Body of Report		
Introduction	†	L
Conclusions	†	M
Recommendations	†	N
Text	*	O,P,Q
Back Matter		
References	†	R
Bibliography	‡	S

Appendices	‡	T
Glossary	‡	U
Index	‡	V
Technical report data sheet, EPA Form 2220-1	*	W

Back Cover

Spine

* Element necessary; † element usually included; ‡ element optional.

General Format Requirements

This subsection provides specifications that are applicable to more than one of the report elements previously identified. It provides general specifications for report covers, print size, image area, spacing, headings, page numbering, equations, footnotes, abbreviations, illustrations, tables, fold-ins, dividers, and paper-saving considerations.

Covers

The Technical Information Operations Staff (TIOS), Cincinnati OH, is responsible for the design and production of camera-ready artwork for all covers (front and back), including the assignment of report numbers for all ORD scientific and technical reports. Requests to TIOS for cover artwork and report numbers must be submitted in writing through the cognizant Project Officer and Technical Information Coordinator.

In cases where the author(s) have a specific design idea to be used as part of the cover art, the original piece of art must be submitted to TIOS in advance with the written request for cover artwork.

Typing

When final camera-ready copy is typed, considerable attention should be given to the selection of equipment to maintain consistency of type styles, spacing, point sizes, etc., throughout the publication.

The recommended typeface is Univers. Where Univers is not available, Helvetica may be used. Two alternative type faces, Times Roman and Baskerville, may be substituted for body copy only. Typewriter type or IBM Composer (10-point) may also be used for text bodies, if the report is not to be typeset.

Type size for tabular material, callouts, illustrations, charts, graphs, tables, etc., must be no smaller than 6-point or approximately 1/16 of an inch, and no larger than 10-point, or approximately 1/9 of an inch when used for the final camera-ready copy.

This is an example of 6-point type.

This an example of 8-point type.

This is an example of 10-point type.

Paste-Up

If text matter is not typed directly on the Typing Guide Sheet (TGS) and is typed in galley form, the galleys must be mounted on the TGS for printing. RUBBER CEMENT should be used for this purpose. This applies to mounting all copy, tables, charts, illustrations, photos, etc. within the image area. DO NOT USE SCOTCH TAPE, GLUE OR STAPLES TO MOUNT CAMERA-READY ART or COPY! The use of tape, glue, staples, etc. creates a distortion on the camera-ready material and will show up on the negatives that the printer uses in making his plates.

Size

All standard ORD research reports and manuals are to be printed on 8½ by 11-inch paper.

Image Area

Final camera-ready copy of ORD reports must be prepared within an image area of 6½ by 9⅛ inches (16.51 by 23.18 cm or 39½ x 55 picas) including page number. The image area dimensions also apply to text which is typeset in two-column widths. In these instances each column should be approximately 3⅛ inches (19 picas) in width with ¼ inch (18 points) of separation. The Typing Guide Sheet (TGS) which specifies exactly these dimensions is to be used for the preparation of the camera-ready copy. Instructions for its use are contained in Sample A. A supply of TGS's is available upon request through the Project Officer, the Technical Information Coordinator, or the Technical Information Operations Staff (TIOS), Cincinnati OH 45268 or by calling 513-684-7551

Color Printing

The use of color must be approved by the EPA Headquarters Printing Management Office. The Project Officer will submit the request to the Director of Technical Information, ORD, (RD-674), Washington DC 20460.

Spacing and Headings

The **DRAFT** of a final report (prepared for approval of the Project Officer) shall be typed double space or space-and-a-half. After the draft is approved by the Project Officer, the camera-ready copy of the **FINAL** report must be typed single space on one side of the TGS, which is suitable for reproduction (see Sample O, Page of Text).

Headings should stand out from the text, and the relative importance of each heading should be readily apparent.

Page Numbering

Front Matter (Preliminary Pages): Except for the title page (which is counted as page i, but not indicated), number the front matter consecutively with lower case Roman numerals (ii, iii, iv, etc.).

Body of the Report and Back Matter: Only the first page of the body of the report (normally, the Introduction) begins on a new right-hand page (page 1); thereafter, each new section begins on the next available page. The body of the report and the back matter must be numbered consecutively with Arabic numerals. Allow no blank pages.

Equations, Footnotes, and Abbreviations

Equations: short, simple, and unnumbered equations should be treated as part of the text. When possible, type simple fractions on one line using a diagonal line and parentheses to avoid ambiguity, e.g., 1/(a + b) not 1/a + b or $\frac{1}{a+b}$. Treat equations (and formulas) that require special symbols, positioning, or brackets as figures, and display the equation on a line by itself, centered on the width of the page with spacing (e.g., 1½ lines) above and below.

Instructions concerning mathematical and chemical equations—that is, the numbering, defining of symbols, breaking (dividing), building up, enclosing in parentheses, etc.—can be found in the Government Printing Office *Style Manual* and in other style manuals such as those issued by the American Chemical Society (1155 Sixteenth St., NW., Washington DC 20036) or the American Society of Civil Engineers (345 East 47th Street, New York NY 10017).

Footnotes: In the text, footnotes should be kept to a minimum. The symbols used for table footnotes (*, †, ‡) may be followed or superscript numerals may be used, if desired.

Abbreviations: Acceptable modes for general abbreviations are found in standard dictionaries and in the Government Printing Office *Style Manual*. Technical abbreviations may be found in the appropriate reference documents for the particular subject area involved. (See also Sample J.)

Illustrations

Illustrations should be treated consistently throughout the document and used only if they: relate entirely to the transaction of public business and are in the public interest; relate directly to the subject matter and are necessary to explain the text; do not aggrandize any individual; are in good taste; or illustrate employees engaged in work- or service-related duties. Examples and instruction on preparing illustrations are given with Sample P.

When preparing illustrations for ORD reports, make sure that line-weights, tone values or any shading used is consistent throughout the report.

Take care in preparing line-illustrations, making sure that only BLACK ink is used! Any lines to be used for illustrations, tables, charts, graphs, etc. should be ruled with ink, preferably with technical drafting pens.

The use of Xerox copies, blueprints, and diazo prints is NOT ACCEPTABLE for camera-ready art or copy. These DO NOT reproduce well when photographed for printing.

Oversized illustrations should be reduced to fit within the image area or sectioned and mounted on TGS's.

When charts and graphs are used in a report and a visible grid is desired, MAKE SURE that the grid background is RED! BLUE and GREEN grids do not photograph well.

Tables

The Government Printing Office *Style Manual* may be helpful for preparing tables. When a report contains only a few pages of text and many tables, place tables in numerical sequence following the text. A typical table used in an ORD report and suggestions for preparing tables are given with Sample Q.

Fold-ins and Divider Pages

Do not use divider pages—those that merely serve to separate the report into parts. The use of fold-ins is also not acceptable. The paper, printing, binding efforts, and costs normally incurred when using fold-ins can usually be saved with preliminary planning: reduce wide tables, have tables fall on successive pages, separate maps into several parts, etc.

Spine

An identifying brief title and the report number will be printed on the backbone or spine of each ORD publication having a thickness of approximately ¼ inch or more (¼ inch is approximately 96 pages).

Errata and Addenda

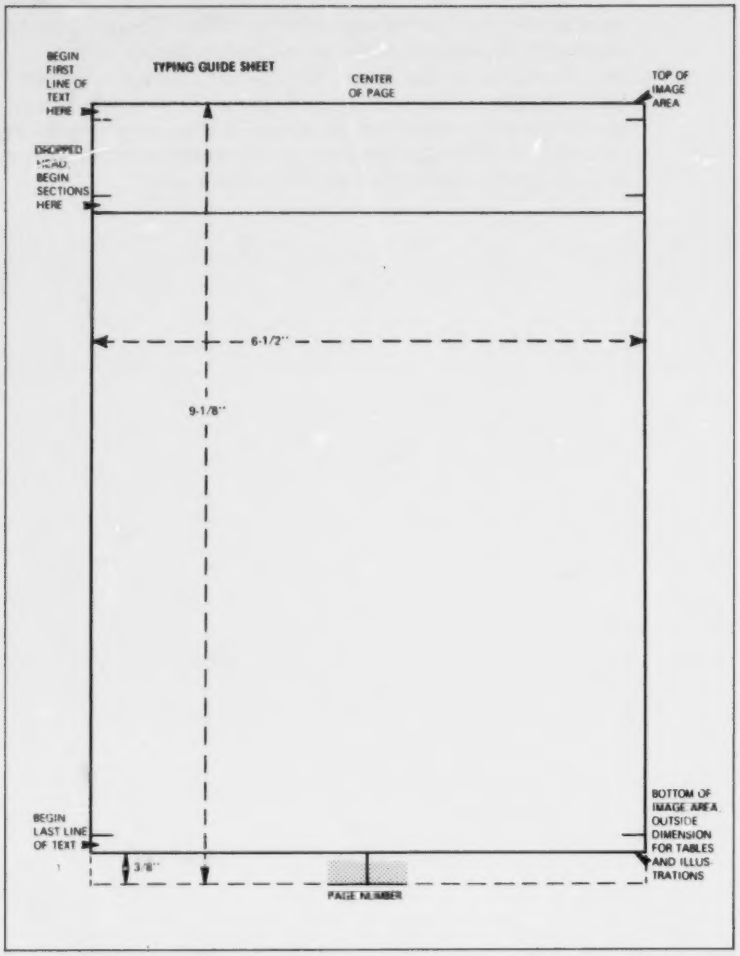
All changes to reports already printed and listed with the National Technical Information Service (NTIS) must bear the same EPA number and issuance date which appear on the original printed report. For additional information and procedures for processing and distributing modifications to existing reports, contact the Technical Information Operations Staff (TIOS), Environmental Research Information Center (ERIC), Cincinnati OH 45268.

Paper Saving Considerations

Because of the rising cost and scarcity of paper and increased shipping and mailing costs, reproduction costs, book storage and shelving costs, etc., each individual responsible for preparing ORD reports is strongly encouraged to consider appropriate techniques for saving paper. Suggestions for this purpose include: reducing and cropping tables, figures, and photographs to their smallest usable size; combining tables and figures with text on one page; and where practical, placing lists of items in double columns.

Samples

This subsection provides examples of each major element of an ORD report (previously listed in the paragraph entitled "Report Organization") and examples of material such as the Typing Guide Sheet, illustrations, tables, etc. (described in the above material on "General Format Requirements"). Each sample is intended to illustrate an acceptable form, style and content for the particular element or area of the report being addressed and to provide additional guidance that will assist the individual responsible for preparing that element/area of a given report.



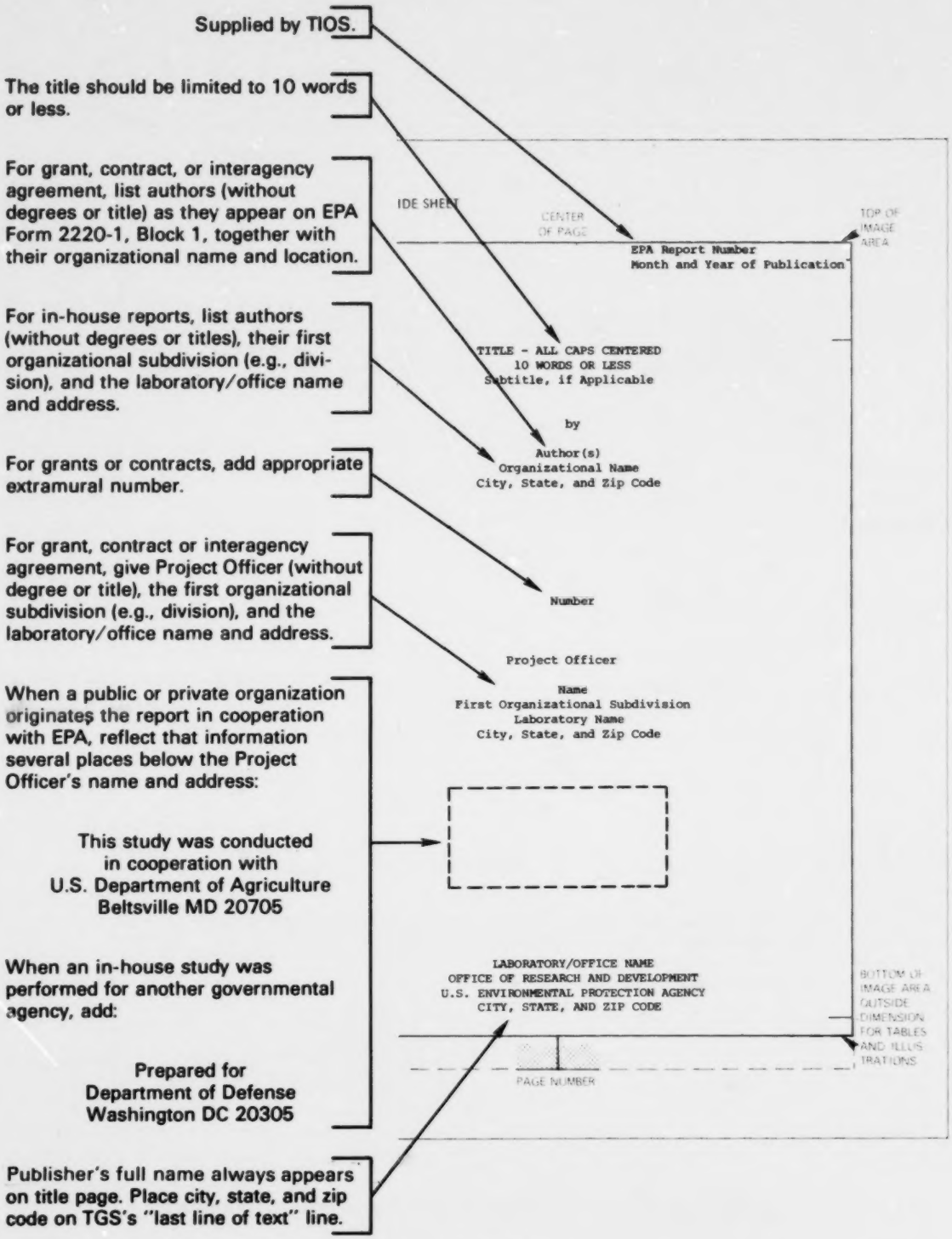
The sample Typing Guide Sheet (TGS) above specifies the required image area to be used for preparing final camera-ready copy of ORD reports. Any ORD report *not* prepared on TGS's will be rendered UNACCEPTABLE and returned. TGS's are available from the Project Officer or the Technical Information Coordinator. If their supply is exhausted, the TGS's can be obtained from the Technical Information Operations Staff, (TIOS), Cincinnati OH.

When using a TGS for normal text, begin typing one line below the top of the image area border. For front matter (preliminary pages) and section headings, begin typing on the "dropped head" line (see Sample O. Page of Text). Fill the page fully, but do not exceed the line indicated for "last line of text."

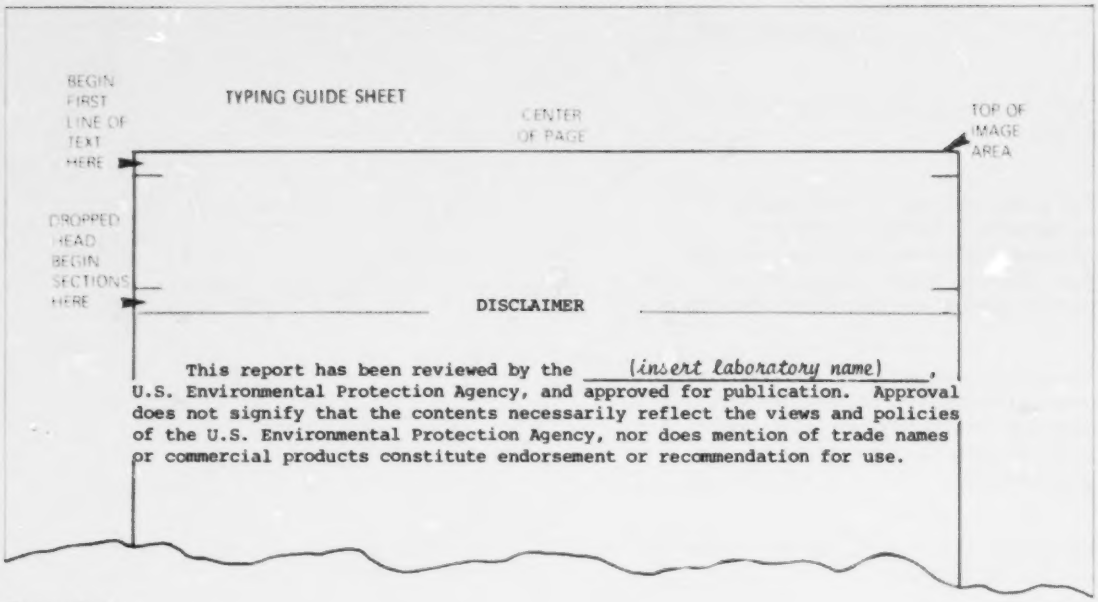
If tables and illustrations occupy or can be reduced to occupy less than a full page, combine with text. If, however, a table or illustration will occupy the greater portion of the image area, center it within the image area. Oversized tables or illustrations should be reduced to fit within the TGS image area or be separated into parts and placed on several succeeding pages (see Sample P. Illustrations, and Sample Q. Tables).

Place page numbers on the perpendicular mark (identified at Page No.). The printer uses properly placed page numbers as a benchmark to position (align) pages; this aids in presenting a uniform appearance to the report.

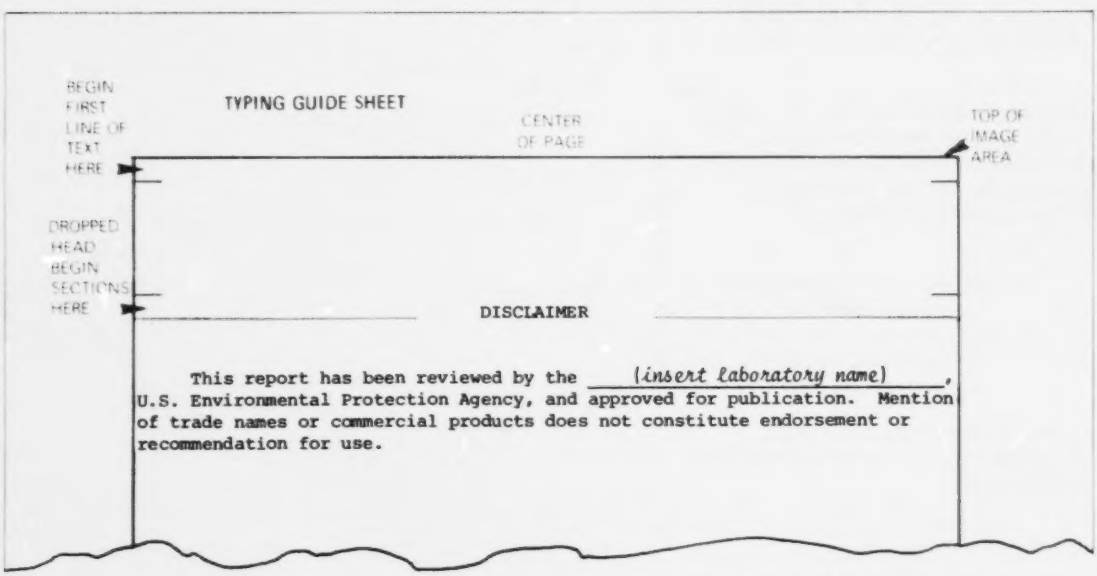
Sample A. Typing Guide Sheet instructions.


Supplied by TIOS.
The title should be limited to 10 words or less.
For grant, contract, or interagency agreement, list authors (without degrees or title) as they appear on EPA Form 2220-1, Block 1, together with their organizational name and location.
For in-house reports, list authors (without degrees or titles), their first organizational subdivision (e.g., division), and the laboratory/office name and address.
For grants or contracts, add appropriate extramural number.
For grant, contract or interagency agreement, give Project Officer (without degree or title), the first organizational subdivision (e.g., division), and the laboratory/office name and address.
When a public or private organization originates the report in cooperation with EPA, reflect that information several places below the Project Officer's name and address:
This study was conducted in cooperation with U.S. Department of Agriculture Beltsville MD 20705
When an in-house study was performed for another governmental agency, add:
Prepared for Department of Defense Washington DC 20305
Publisher's full name always appears on title page. Place city, state, and zip code on TGS's "last line of text" line.
IDE SHEET
CENTER OF PAGE
TOP OF IMAGE AREA
EPA Report Number
Month and Year of Publication
TITLE - ALL CAPS CENTERED
10 WORDS OR LESS
Subtitle, if Applicable
by
Author(s)
Organizational Name
City, State, and Zip Code
Number
Project Officer
Name
First Organizational Subdivision
Laboratory Name
City, State, and Zip Code
LABORATORY/OFFICE NAME
OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
CITY, STATE, AND ZIP CODE
BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
PAGE NUMBER

Sample B. Title page.


BEGIN FIRST LINE OF TEXT HERE
TYPING GUIDE SHEET
CENTER OF PAGE
TOP OF IMAGE AREA
DROPPED HEAD BEGIN SECTIONS HERE
DISCLAIMER
This report has been reviewed by the (insert laboratory name), U.S. Environmental Protection Agency, and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the U.S. Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

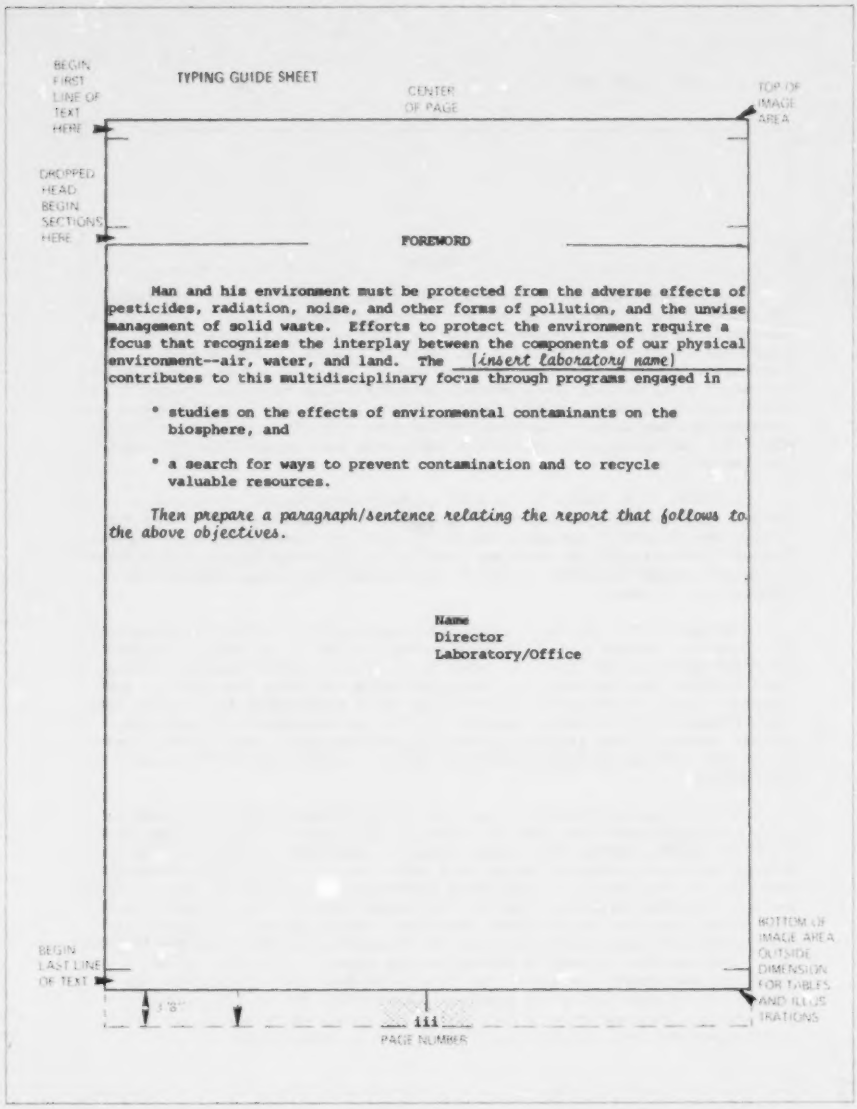
Example 1


BEGIN FIRST LINE OF TEXT HERE
TYPING GUIDE SHEET
CENTER OF PAGE
TOP OF IMAGE AREA
DROPPED HEAD BEGIN SECTIONS HERE
DISCLAIMER
This report has been reviewed by the (insert laboratory name), U.S. Environmental Protection Agency, and approved for publication. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

Example 2

For grants or contracts use Example 1; for in-house reports, use Example 2.

Sample C. Disclaimer notice.


BEGIN FIRST LINE OF TEXT HERE
TYPING GUIDE SHEET
CENTER OF PAGE
TOP OF IMAGE AREA
DROPPED HEAD: BEGIN SECTIONS HERE
FOREWORD
Man and his environment must be protected from the adverse effects of pesticides, radiation, noise, and other forms of pollution, and the unwise management of solid waste. Efforts to protect the environment require a focus that recognizes the interplay between the components of our physical environment--air, water, and land. The [insert laboratory name] contributes to this multidisciplinary focus through programs engaged in
* studies on the effects of environmental contaminants on the biosphere, and
* a search for ways to prevent contamination and to recycle valuable resources.
Then prepare a paragraph/sentence relating the report that follows to the above objectives.
Name
Director
Laboratory/Office
BEGIN LAST LINE OF TEXT HERE
BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
1"
iii
PAGE NUMBER

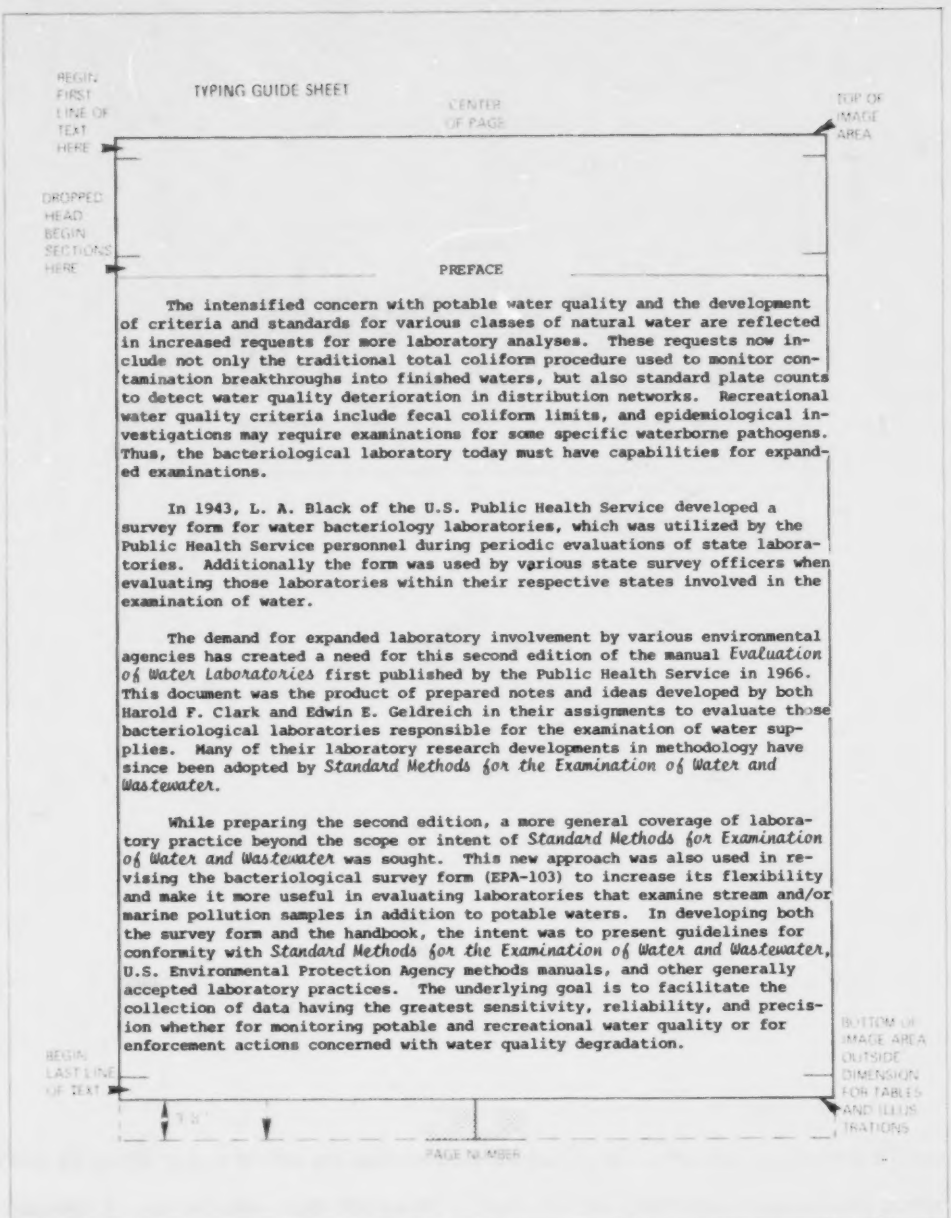
The Foreword is a necessary statement from someone other than the author and is signed by that person.

In ORD reports, the format is structured so that the first paragraph describes the type of research, or direction, of the originating laboratory/office and its relation to the overall purpose of EPA or to the laws under which EPA, the laboratory, or the office operates.

The last paragraph (or sentence) can be used by the author or Project Officer to relate, in lay language, the work being reported to the overall objectives of the laboratory—consider the subject matter, the potential reader, the application of the reported work.

The Foreword for each laboratory should differ; this sample is intended only as a guide.

Sample D. Foreword.


TYPING GUIDE SHEET
BEGIN FIRST LINE OF TEXT HERE
CENTER OF PAGE
TOP OF IMAGE AREA
DROPPED HEAD BEGIN SECTIONS HERE
PREFACE
The intensified concern with potable water quality and the development of criteria and standards for various classes of natural water are reflected in increased requests for more laboratory analyses. These requests now include not only the traditional total coliform procedure used to monitor contamination breakthroughs into finished waters, but also standard plate counts to detect water quality deterioration in distribution networks. Recreational water quality criteria include fecal coliform limits, and epidemiological investigations may require examinations for some specific waterborne pathogens. Thus, the bacteriological laboratory today must have capabilities for expanded examinations.
In 1943, L. A. Black of the U.S. Public Health Service developed a survey form for water bacteriology laboratories, which was utilized by the Public Health Service personnel during periodic evaluations of state laboratories. Additionally the form was used by various state survey officers when evaluating those laboratories within their respective states involved in the examination of water.
The demand for expanded laboratory involvement by various environmental agencies has created a need for this second edition of the manual Evaluation of Water Laboratories first published by the Public Health Service in 1966. This document was the product of prepared notes and ideas developed by both Harold F. Clark and Edwin E. Geldreich in their assignments to evaluate those bacteriological laboratories responsible for the examination of water supplies. Many of their laboratory research developments in methodology have since been adopted by Standard Methods for the Examination of Water and Wastewater.
While preparing the second edition, a more general coverage of laboratory practice beyond the scope or intent of Standard Methods for Examination of Water and Wastewater was sought. This new approach was also used in revising the bacteriological survey form (EPA-103) to increase its flexibility and make it more useful in evaluating laboratories that examine stream and/or marine pollution samples in addition to potable waters. In developing both the survey form and the handbook, the intent was to present guidelines for conformity with Standard Methods for the Examination of Water and Wastewater, U.S. Environmental Protection Agency methods manuals, and other generally accepted laboratory practices. The underlying goal is to facilitate the collection of data having the greatest sensitivity, reliability, and precision whether for monitoring potable and recreational water quality or for enforcement actions concerned with water quality degradation.
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A report may include a preface prepared by the author. Here the author can include such information as the reasons for undertaking the work, the research method, if it might bear on the reader's understanding of the text, or the limitations within which the subject was studied. Because the reader assumes the preface was written by the author, it usually is not signed.

If a preface is used, it follows the Foreword on a new page.

Sample E. Preface

TYPING GUIDE SHEET

ABSTRACT

This research program was initiated with the overall objective of determining incinerator design and operational criteria that can effect complete thermal degradation of pesticides.

An experimental incineration system was designed and constructed to evaluate the effect of operational variables (rate of pesticide injection, percent excess air, operating temperature, and retention time) on the efficiency with which organic pesticides can be incinerated. This system included a pilot-scale incinerator (45.4 kg/hr (100 lb/hr) Type 1 waste capacity), a three-stage scrubber, and a scrubber water treatment system. Nine pesticides (DDT, aldrin, picloram, malathion, tomaphene, atrazine, captan, zineb, and mirex) in 15 liquid and solid formulations were tested by injection into the primary combustion chamber.

Results of the incineration test were evaluated in terms of the efficiency of active ingredient destruction, i.e., the percent of the pesticide destroyed. Efficiencies of greater than 99.99% were achieved for all pesticides tested except mirex over a range of combustion chamber retention time-temperature combinations. Test results were used to estimate stack emission rates for the subject pesticides when incinerated at 1000°C (1832°F) with 2-sec retention time.

A set of operating conditions (temperature, retention time, and excess air rate) was developed from comparable results for all 15 formulations; these conditions are believed to be applicable to the incineration of all organic pesticides.

Analysis of the incinerator effluents also showed that high concentrations of sulfur dioxide and cyanide were present when organosulfur and organonitrogen pesticides, respectively, were incinerated under certain operating conditions. Particulate loadings in the effluent gases during the incineration of solid pesticide formulations (dusts, wettable powders, granules, and pellets) were above Federal limits established for new stationary sources having a capacity of or greater than 45,000 kg/day (50 tons/day). Thus, emission control devices will be required for pesticide incinerators.

This report was submitted in fulfillment of Contract No. 68-03-0286 by Midwest Research Institute under the sponsorship of the U.S. Environmental Protection Agency. This report covers the period February 1, 1974, to January 31, 1976, and work was completed as of February 28, 1976.

iv

Abstracts are précis of the contents of the report and are intended to make it unnecessary for readers to refer to the original report unless the material is of real interest to them. They may be indicative or informative.

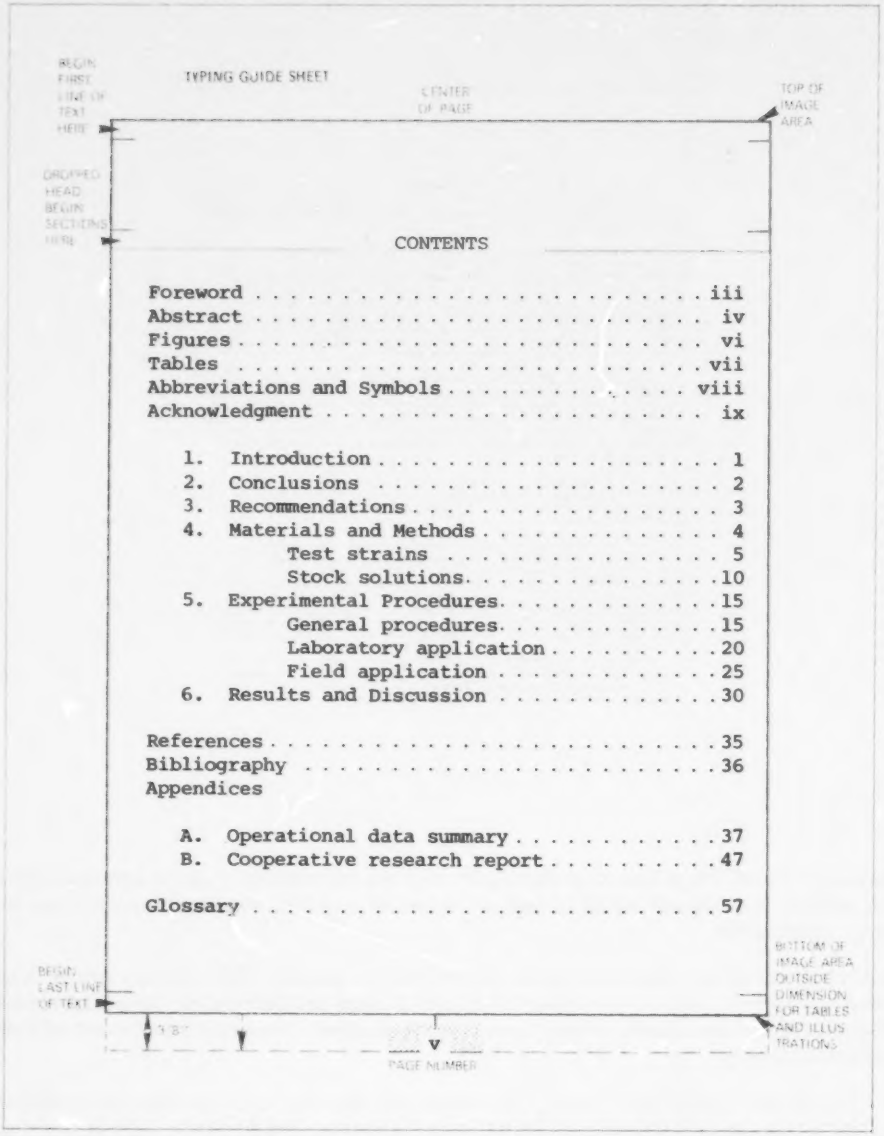
The indicative (descriptive) abstract is generally limited to between 200 and 250 words; it tells the reader what the report is about—narrative facts about what will be read in the actual report. An informative abstract gives details, in the most concise manner, of what was reported and presents conclusions and results.

The EPA Form 2220-1 (Technical Report Data sheet, Sample W) limits the abstract to 200 words and, thus, generally permits the use of the indicative abstract. The Abstract, as it appears on page iv of a report, may contain up to 450 words, which permits the use of an informative-type abstract.

In the "work-done-under" statement, which is always placed as the last paragraph of the abstract in extramural reports, the relationship of the prime and the subgrantee or subcontractor can be described in addition to the necessary information contained in the following statement: This report was submitted in fulfillment of (*grant or contract number*) by (*contractor or grantee*) under the (partial) sponsorship of the U.S. Environmental Protection Agency. This report covers a period from (*date*) to (*date*), and work was completed as of (*date*).

On in-house project reports, the following statement is always the last paragraph of the abstract: This report covers a period from (*date*) to (*date*) and work was completed as of (*date*).

Sample F. Abstract.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CONTENTS
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PAGE NUMBER

The contents page should begin on a new right-hand, odd-numbered page, usually "v." Although preliminary pages (front matter) are not part of the subject matter, they are part of the document and are included in the contents.

The contents include the main headings of the document and the pages on which they appear; use dot leaders to aid readability. Meaningful subheads (indented and subordinated) may be included, if necessary. Avoid double spacing between major sections when it would cause contents to have a short overrun on the following page. Omit contents on short, under 24- to 32-page documents or if unnecessary.

Sample G. Contents.

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FIGURES
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1 Schematic of sewage treatment operations sludge characteristics 9
2 Schematic of existing sewage treatment plants modified to provide secondary and/or tertiary treatment. 10
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4 Distribution of sewage treatment plants using land-spreading on a routine basis. 64
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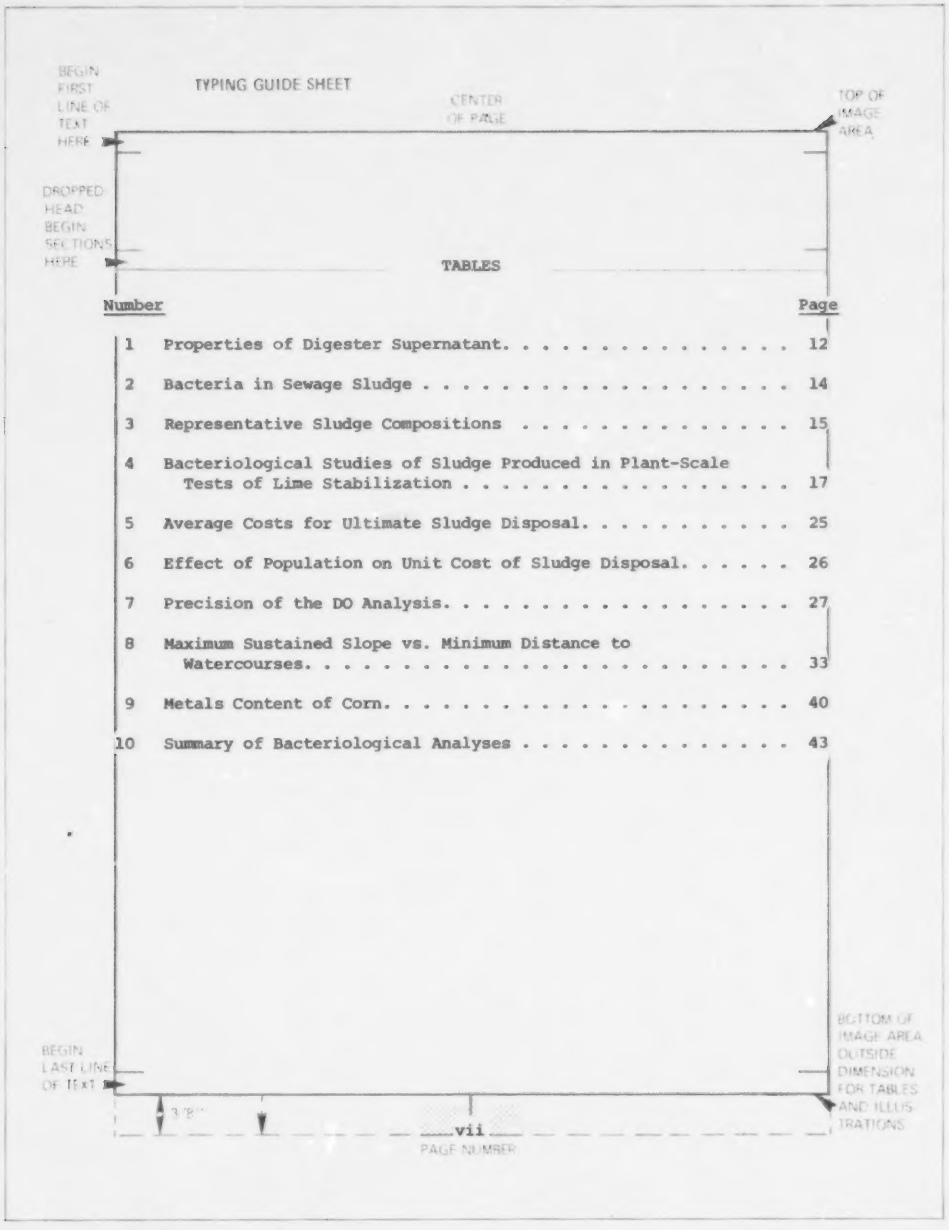
A list of illustrations (figures, maps, charts, plates) need be included only if considered helpful or essential. For each illustration, give the figure number, the figure legend as it appears in the report (in shortened form, if lengthy), and the page number. Avoid double spacing when it would cause a list of figures to have a short overrun on the following page.

If lists of tables and illustrations are short, combine on one page or combine with contents page.

Sample H. List of illustrations.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1 Properties of Digester Supernatant. 12
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4 Bacteriological Studies of Sludge Produced in Plant-Scale Tests of Lime Stabilization 17
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6 Effect of Population on Unit Cost of Sludge Disposal. 26
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10 Summary of Bacteriological Analyses 43
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A list of tables need be included only if considered helpful or essential. For each table, give table number, table caption as it appears in the report (shortened if necessary), and page number. Avoid double spacing when it would cause lists of tables to have a short overrun on the following page. If lists of tables and figures are short, combine on one page, or combine with table of contents.

Sample I. List of tables.

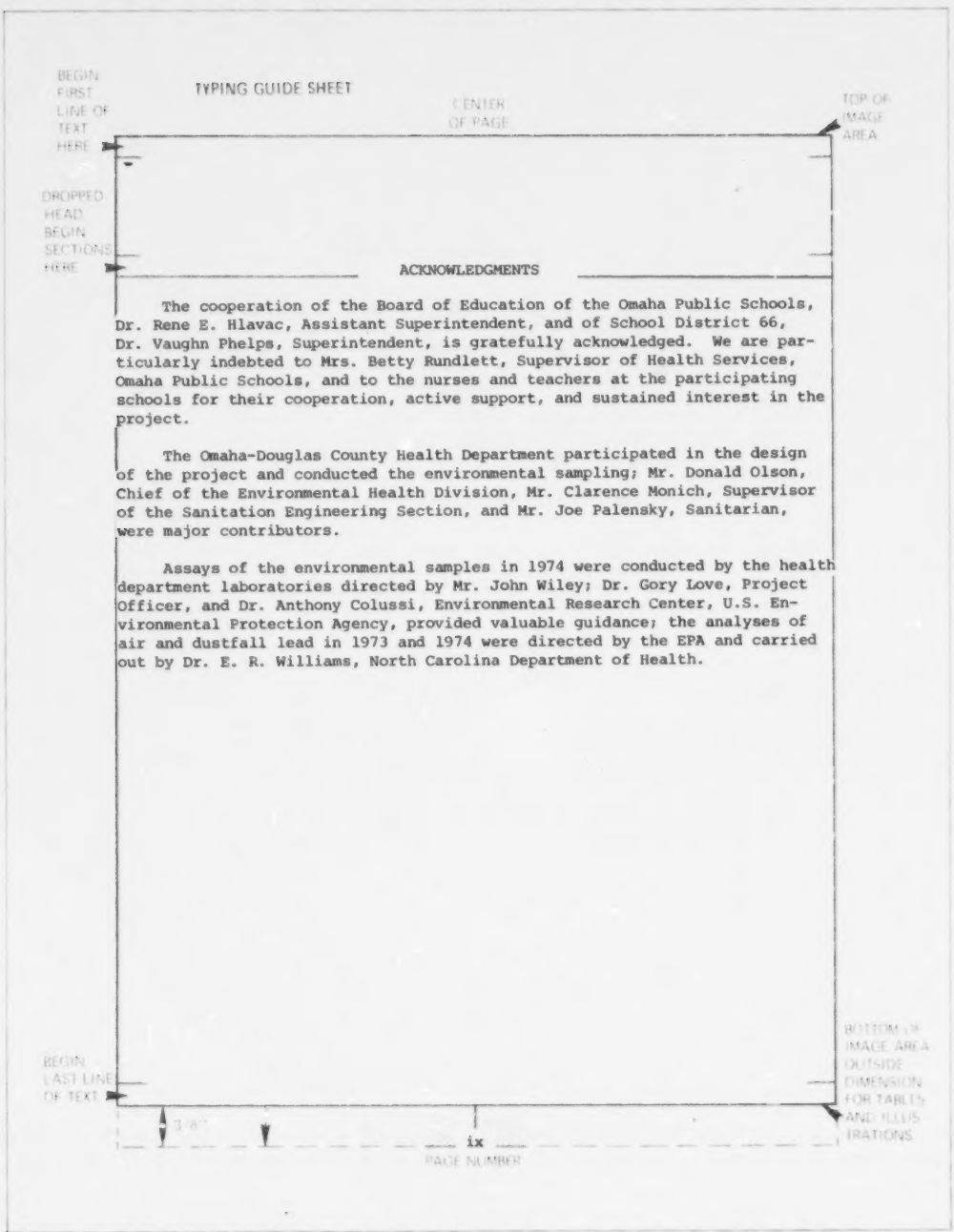
TYPING GUIDE SHEET
LIST OF ABBREVIATIONS AND SYMBOLS
ABBREVIATIONS
DTPA -- diethylenetriamine pentaacetic acid
EC -- electrical conductivity
Jtu -- Jackson turbidity units
kg/ha -- kilogram per hectare
meq -- milliequivalent
mmhos/cm -- millimhos per centimeter
t/ha -- metric tonne per hectare
r -- correlation coefficient
R^2 -- coefficient of multiple regression squared
SS -- suspended solids
TS -- total solids
VS -- volatile solids
SYMBOLS
C -- carbon
Ca -- calcium
CH_4 -- methane gas
η -- viscosity
Yb_2O_3 -- ytterbium oxide
A Area; also constant used in one-dimensional flow solution
a Channel width
B Constant used in one-dimensional flow solution
B_1 Depth of scumboard below weir
B_2 Overflow height (Fig. 5)
C Particle concentration
h Channel minimum depth
h(x) Channel depth as a function of radius
k von Karman constant
L Weir length
n Manning coefficient
P Pressure
q Lateral discharge
viii

Abbreviations of symbols for the less common or specialized terms used in the text should be given in parentheses following their first use in the text. Thereafter, the abbreviation or symbol may be used.

When is a list necessary? For each report, define the possible readership, the number of abbreviations and symbols used, and the unusualness of or difficulty in defining or understanding these terms; if assembling and defining them will aid the reader, do so.

Consider using two colums when the list exceeds more than one page.

Sample J. List of abbreviations and symbols.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ACKNOWLEDGMENTS
The cooperation of the Board of Education of the Omaha Public Schools, Dr. Rene E. Hlavac, Assistant Superintendent, and of School District 66, Dr. Vaughn Phelps, Superintendent, is gratefully acknowledged. We are particularly indebted to Mrs. Betty Rundlett, Supervisor of Health Services, Omaha Public Schools, and to the nurses and teachers at the participating schools for their cooperation, active support, and sustained interest in the project.
The Omaha-Douglas County Health Department participated in the design of the project and conducted the environmental sampling; Mr. Donald Olson, Chief of the Environmental Health Division, Mr. Clarence Monich, Supervisor of the Sanitation Engineering Section, and Mr. Joe Palensky, Sanitarian, were major contributors.
Assays of the environmental samples in 1974 were conducted by the health department laboratories directed by Mr. John Wiley; Dr. Gory Love, Project Officer, and Dr. Anthony Colussi, Environmental Research Center, U.S. Environmental Protection Agency, provided valuable guidance; the analyses of air and dustfall lead in 1973 and 1974 were directed by the EPA and carried out by Dr. E. R. Williams, North Carolina Department of Health.
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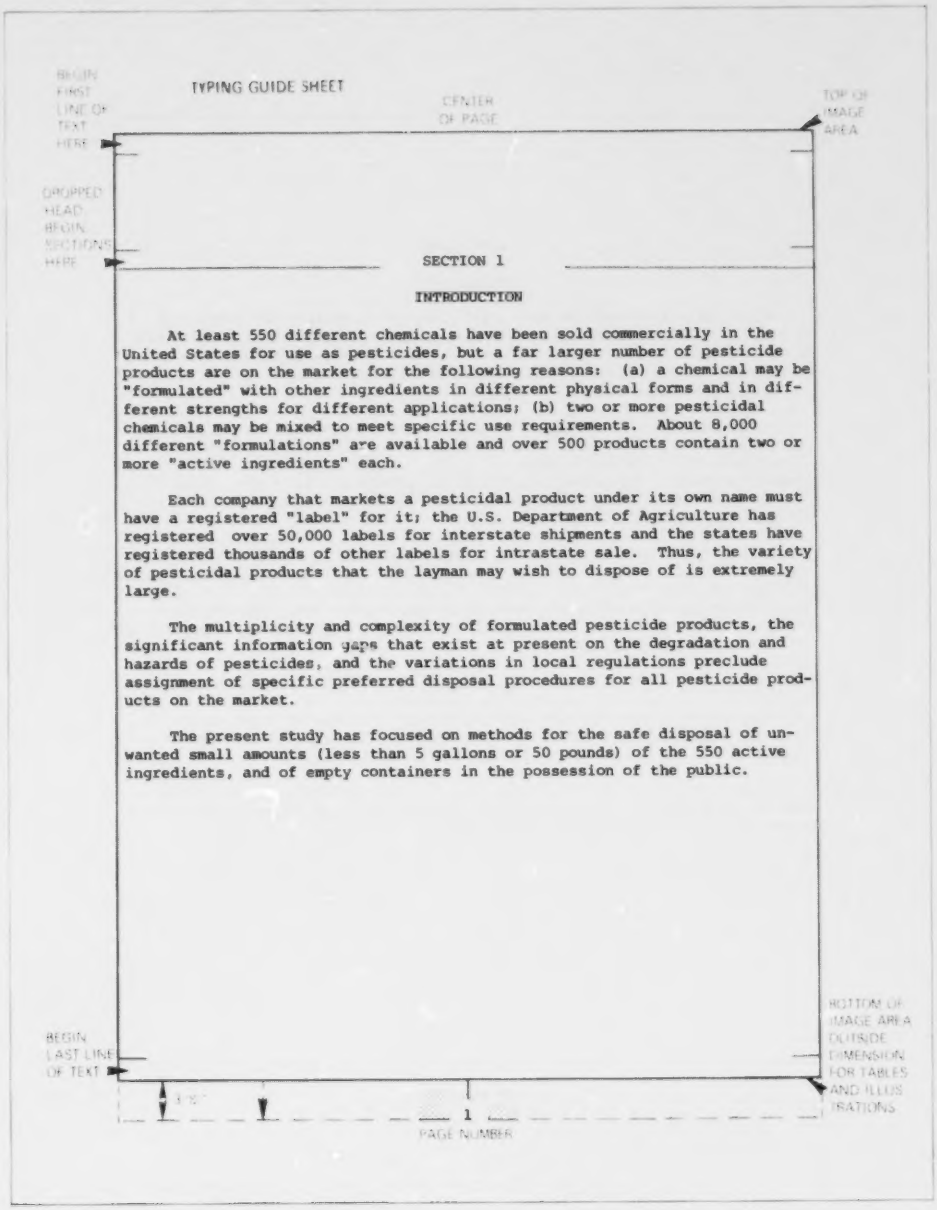
Limit acknowledgments to key personnel and organizations associated with the project that have aided in a major way, e.g., by supplying material or equipment, doing special studies, interpreting special data, or doing statistical analyses. Use simple, formal, and concise wording. Ordinarily, supporting staff work is not included in an acknowledgment.

Sample K. Acknowledgment.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SECTION 1
INTRODUCTION
At least 550 different chemicals have been sold commercially in the United States for use as pesticides, but a far larger number of pesticide products are on the market for the following reasons: (a) a chemical may be "formulated" with other ingredients in different physical forms and in different strengths for different applications; (b) two or more pesticidal chemicals may be mixed to meet specific use requirements. About 8,000 different "formulations" are available and over 500 products contain two or more "active ingredients" each.
Each company that markets a pesticidal product under its own name must have a registered "label" for it; the U.S. Department of Agriculture has registered over 50,000 labels for interstate shipments and the states have registered thousands of other labels for intrastate sale. Thus, the variety of pesticidal products that the layman may wish to dispose of is extremely large.
The multiplicity and complexity of formulated pesticide products, the significant information gaps that exist at present on the degradation and hazards of pesticides, and the variations in local regulations preclude assignment of specific preferred disposal procedures for all pesticide products on the market.
The present study has focused on methods for the safe disposal of unwanted small amounts (less than 5 gallons or 50 pounds) of the 550 active ingredients, and of empty containers in the possession of the public.
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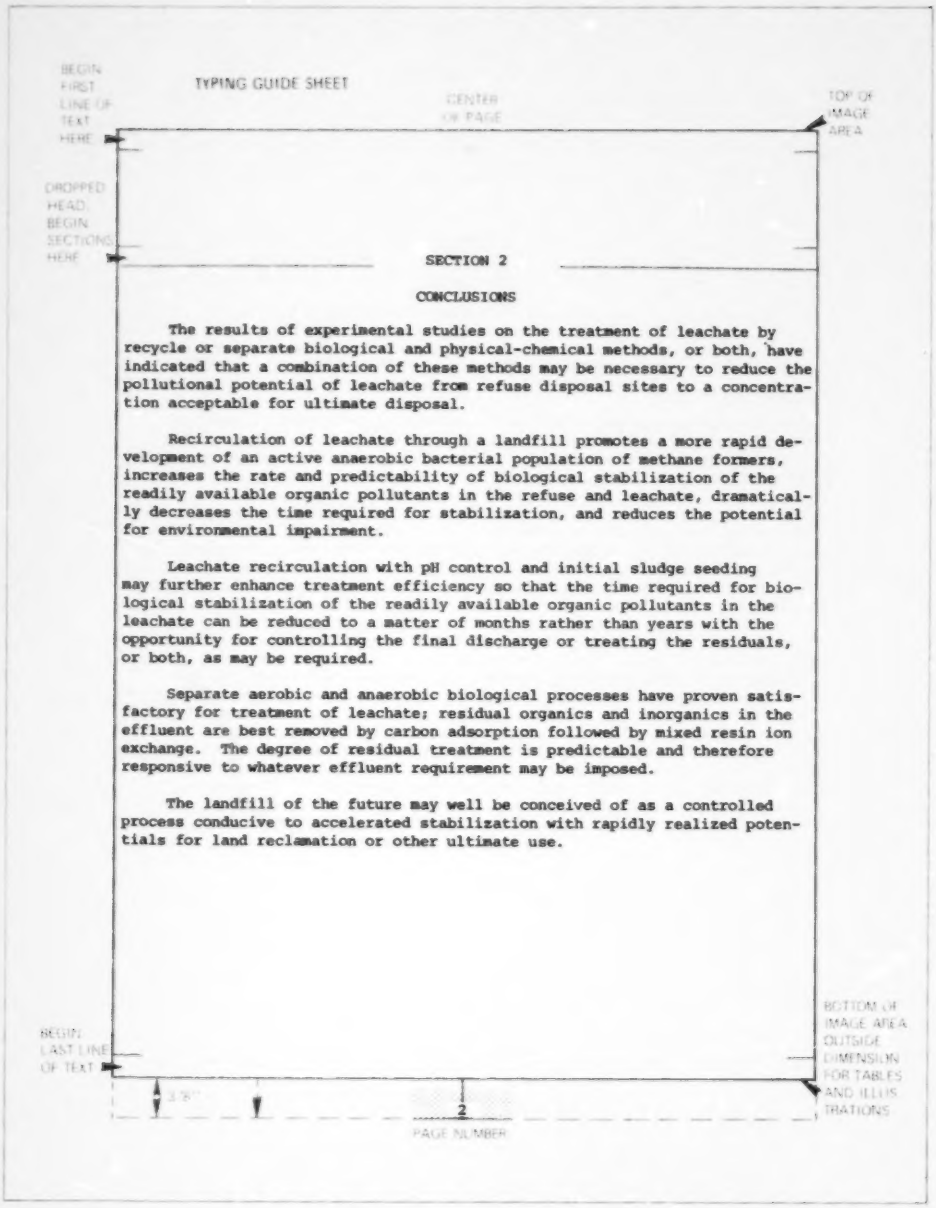
The introduction, as Section 1, sets the stage for the conclusions and recommendations and for the text proper. With this orientation, the reader learns what he should know before he reads the other sections of the report. In one (or two) pages, the problem is stated and the present work is related to earlier work.

A formal introduction, as such, may not be needed in all reports; in simple, short reports, this information could be combined with conclusions or conclusions and recommendations.

Sample L. Introduction.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SECTION 2
CONCLUSIONS
The results of experimental studies on the treatment of leachate by recycle or separate biological and physical-chemical methods, or both, have indicated that a combination of these methods may be necessary to reduce the pollutional potential of leachate from refuse disposal sites to a concentration acceptable for ultimate disposal.
Recirculation of leachate through a landfill promotes a more rapid development of an active anaerobic bacterial population of methane formers, increases the rate and predictability of biological stabilization of the readily available organic pollutants in the refuse and leachate, dramatically decreases the time required for stabilization, and reduces the potential for environmental impairment.
Leachate recirculation with pH control and initial sludge seeding may further enhance treatment efficiency so that the time required for biological stabilization of the readily available organic pollutants in the leachate can be reduced to a matter of months rather than years with the opportunity for controlling the final discharge or treating the residuals, or both, as may be required.
Separate aerobic and anaerobic biological processes have proven satisfactory for treatment of leachate; residual organics and inorganics in the effluent are best removed by carbon adsorption followed by mixed resin ion exchange. The degree of residual treatment is predictable and therefore responsive to whatever effluent requirement may be imposed.
The landfill of the future may well be conceived of as a controlled process conducive to accelerated stabilization with rapidly realized potentials for land reclamation or other ultimate use.
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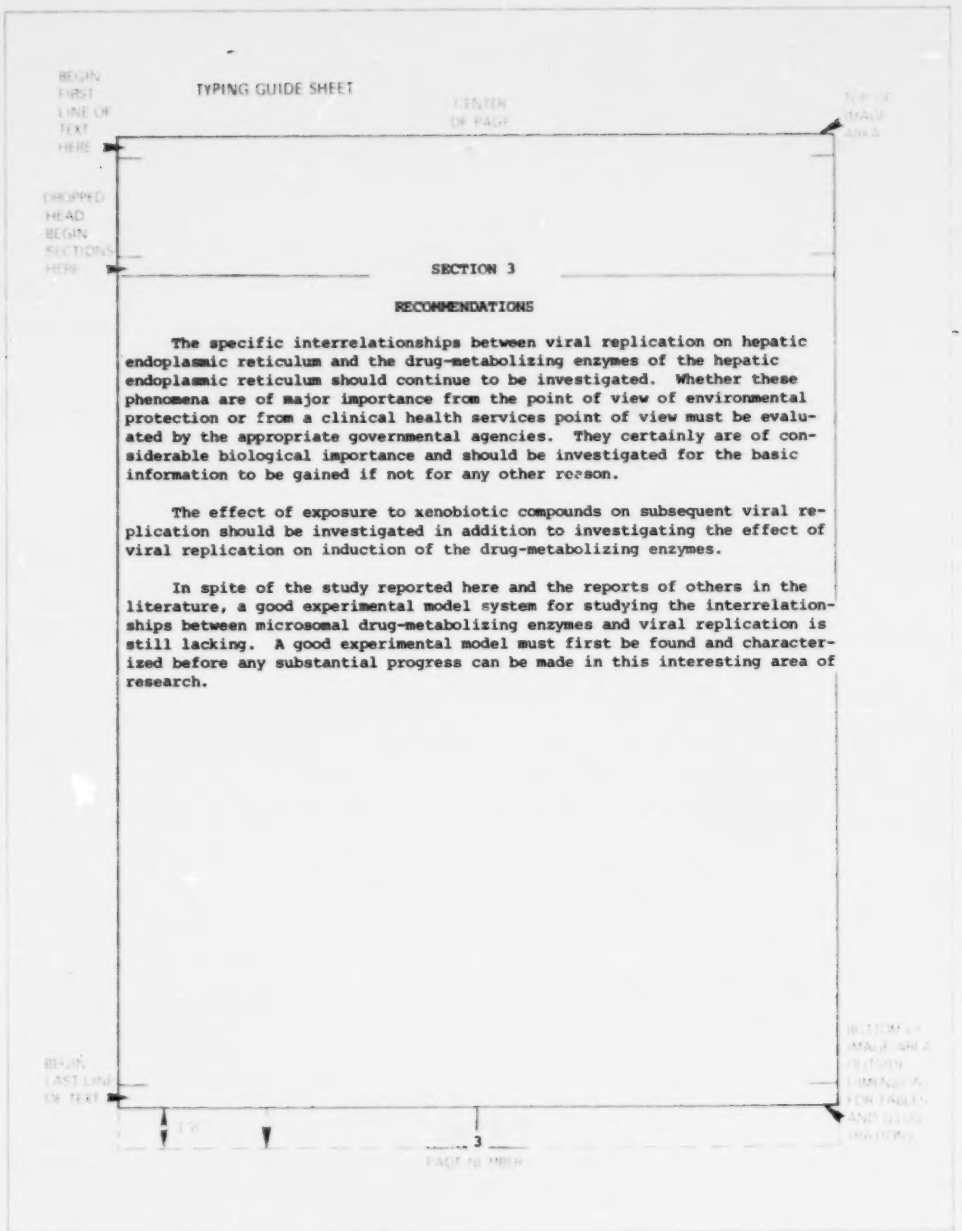
After all the measurements are made—the surveys conducted—the experiments performed—and the significance of these results analyzed and interpreted—what problems did this research solve? These are the conclusions. If the problem was not solved or major mistakes or hazards occurred, they can be included here.

Usually, the conclusions can be stated on one page; when both conclusions and recommendations are short and straightforward, combine them.

Sample M. Conclusions.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SECTION 3
RECOMMENDATIONS
The specific interrelationships between viral replication on hepatic endoplasmic reticulum and the drug-metabolizing enzymes of the hepatic endoplasmic reticulum should continue to be investigated. Whether these phenomena are of major importance from the point of view of environmental protection or from a clinical health services point of view must be evaluated by the appropriate governmental agencies. They certainly are of considerable biological importance and should be investigated for the basic information to be gained if not for any other reason.
The effect of exposure to xenobiotic compounds on subsequent viral replication should be investigated in addition to investigating the effect of viral replication on induction of the drug-metabolizing enzymes.
In spite of the study reported here and the reports of others in the literature, a good experimental model system for studying the interrelationships between microsomal drug-metabolizing enzymes and viral replication is still lacking. A good experimental model must first be found and characterized before any substantial progress can be made in this interesting area of research.
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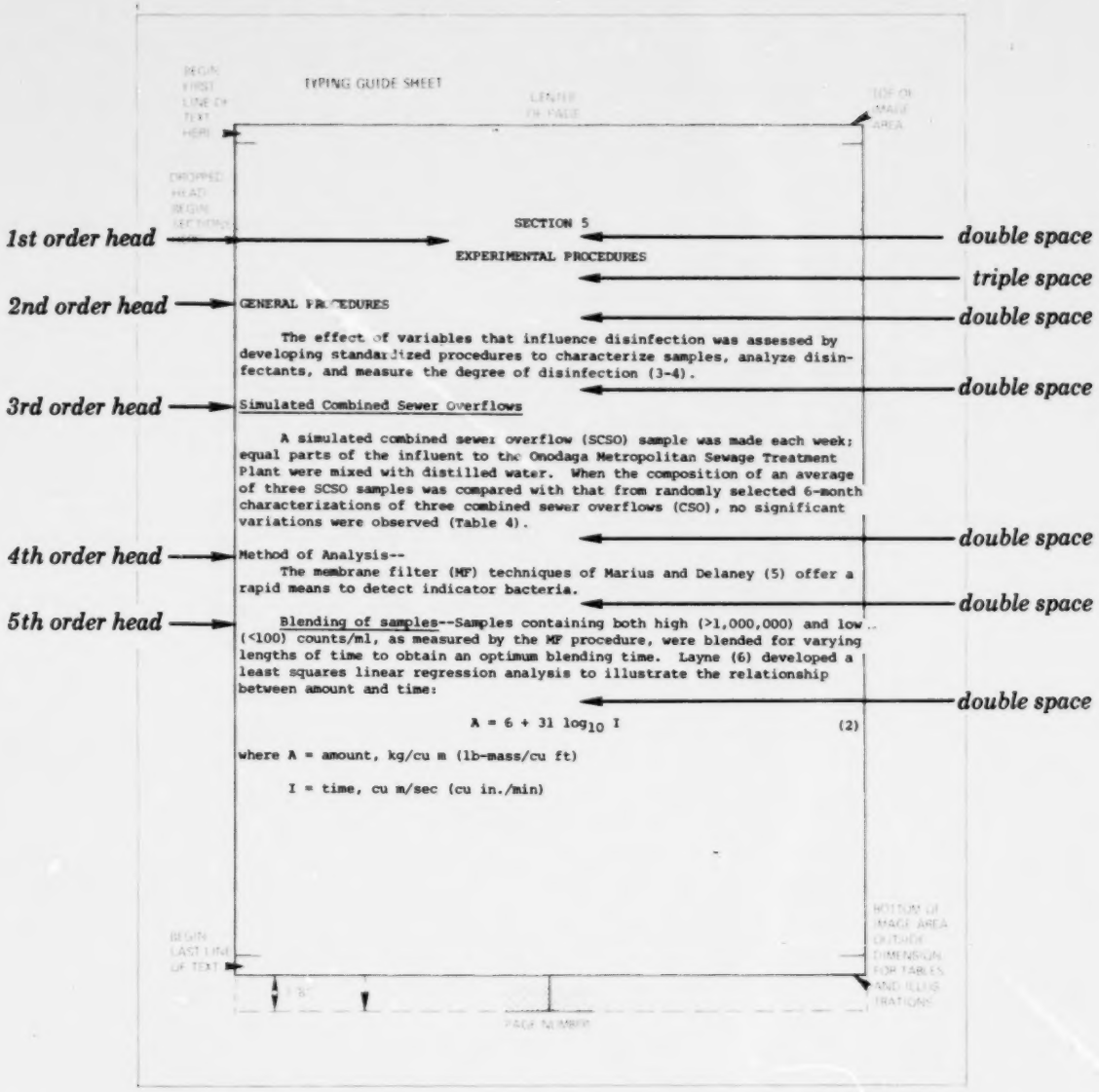
PAGE NUMBER

When the research has been completed and the conclusions have been drawn, is further study or additional information needed to solve the problem? Is a pilot-scale feasibility study needed to reinforce the laboratory findings? Can the conclusions be applied now? Such suggestions for future investigations or activity can be included in a recommendations section. These need occupy but one page, or they can be combined into a conclusions and recommendations section.

Sample N. Recommendations.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SECTION 5
EXPERIMENTAL PROCEDURES
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GENERAL PROCEDURES
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The effect of variables that influence disinfection was assessed by developing standardized procedures to characterize samples, analyze disinfectants, and measure the degree of disinfection (3-4).
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Simulated Combined Sewer Overflows
A simulated combined sewer overflow (SCSO) sample was made each week; equal parts of the influent to the Onodaga Metropolitan Sewage Treatment Plant were mixed with distilled water. When the composition of an average of three SCSO samples was compared with that from randomly selected 6-month characterizations of three combined sewer overflows (CSO), no significant variations were observed (Table 4).
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Method of Analysis--
The membrane filter (MF) techniques of Marius and Delaney (5) offer a rapid means to detect indicator bacteria.
double space
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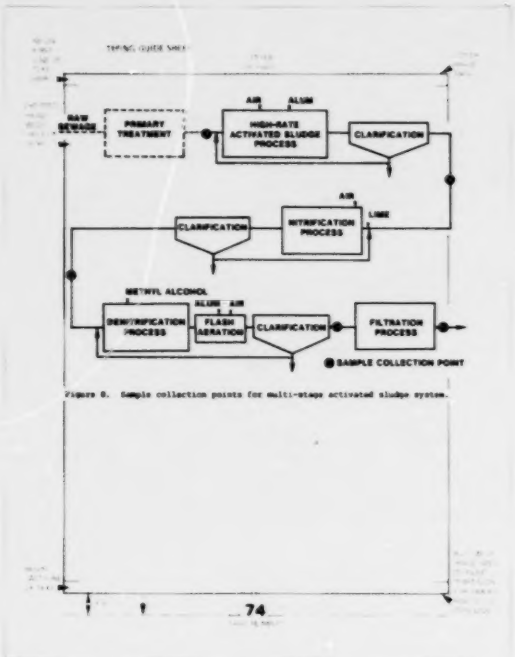
Blending of samples--Samples containing both high (>1,000,000) and low (<100) counts/ml, as measured by the MF procedure, were blended for varying lengths of time to obtain an optimum blending time. Layne (6) developed a least squares linear regression analysis to illustrate the relationship between amount and time:
double space
$A = 6 + 31 \log_{10} I$ (2)
where A = amount, kg/cu m (lb-mass/cu ft)
I = time, cu m/sec (cu in./min)

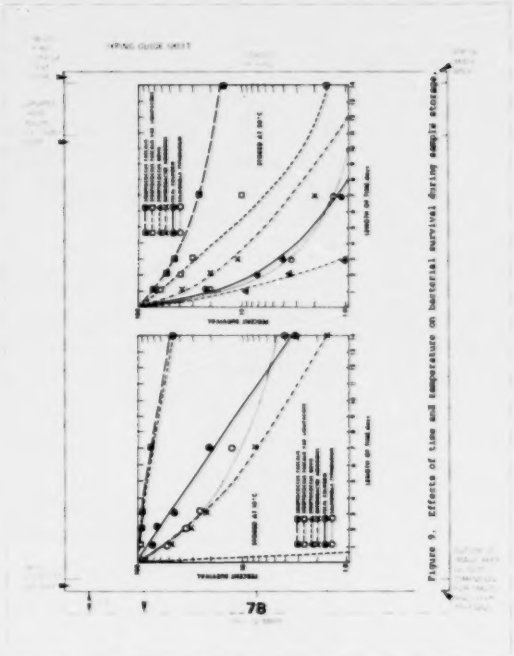
The sample page of text (above) is designed to illustrate some common situations that may be encountered while a manuscript is being prepared; it is intended only as an example.

The use of "headings" (one of many possible "Order of Headings") indicates how they should stand out from the text with their relative importance readily apparent. The spacing between the paragraphs and the headings is designed to aid this.

Other acceptable modes for numbering equations, citing and numbering literature references in the text, defining acronyms, using consistent abbreviations, etc., are illustrated.

Sample O. Page of text.





Because good illustrations enhance the value of technical reports, use them to emphasize, demonstrate, and summarize. Treat illustrations consistently throughout the document.

Place illustrations closely following their first reference in the text; combine with text when possible (see Figure 8 above). When a report contains only a few pages of text and many illustrations, however, place the illustrations in numerical sequence after the text.

When necessary, place illustrations broadwise and center within the image area on a page so that the head of the illustration is to the reader's left, and the bottom of the illustration is to the reader's right, i.e., will be readable when the page is turned clockwise 90° for normal viewing (see Figure 9 above).

In preparing illustrations, care must be exercised to ensure that details and lettering within the illustration are 6 points (about 1/12 inch) or larger and clearly legible after final reproduction. Photographs should be cropped or masked to eliminate insignificant details. Unnecessary border frames should be eliminated.

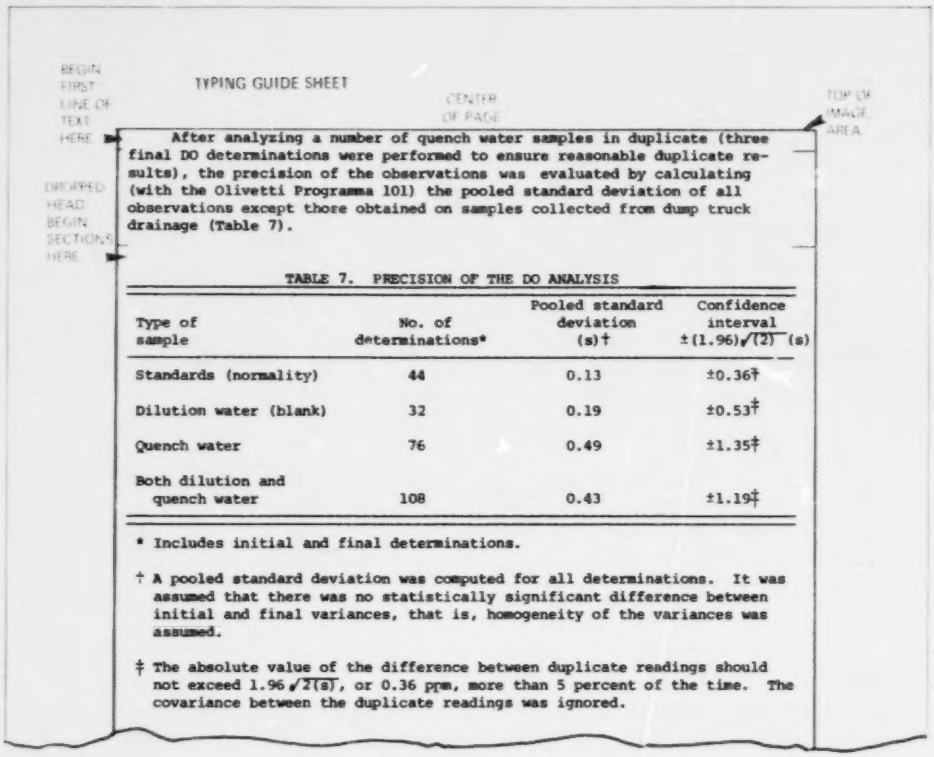
As far as practical, place lettering (callout; label) on an illustration horizontally, unboxed, and near the item identified. There should be high contrast and easy readability. Use a UNIVERS or HELVETICA typeface for all illustrations.

Number illustrations within the text with consecutive Arabic numerals preceded by the word "Figure" (Figure 1, Figure 2). Within appendices, include appendix letter (Figure A-1, Figure B-9).

Each illustration must have a descriptive legend. Center the legend beneath the illustration following the figure number. The legend is usually styled as a sentence; capitalize the first letter of the first word and any proper nouns or chemical or mathematical symbols, and close with a period.

If photographs are required, submit GLOSSY black and white photo prints. Satin finish photo prints are NOT ACCEPTABLE! The finish on these conflicts with the screens used by the printer when preparing the finished plates and causes shadowing and variations in the texture.

Sample P. Illustrations.



After analyzing a number of quench water samples in duplicate (three final DO determinations were performed to ensure reasonable duplicate results), the precision of the observations was evaluated by calculating (with the Olivetti Programma 101) the pooled standard deviation of all observations except those obtained on samples collected from dump truck drainage (Table 7).

TABLE 7. PRECISION OF THE DO ANALYSIS

Type of sample	No. of determinations*	Pooled standard deviation (s)†	Confidence interval $\pm(1.96)\sqrt{(2)}$ (s)
Standards (normality)	44	0.13	±0.36‡
Dilution water (blank)	32	0.19	±0.53‡
Quench water	76	0.49	±1.35‡
Both dilution and quench water	108	0.43	±1.19‡

* Includes initial and final determinations.

† A pooled standard deviation was computed for all determinations. It was assumed that there was no statistically significant difference between initial and final variances, that is, homogeneity of the variances was assumed.

‡ The absolute value of the difference between duplicate readings should not exceed $1.96\sqrt{2(s)}$, or 0.36 ppm, more than 5 percent of the time. The covariance between the duplicate readings was ignored.

When preparing tables, organize the tables as simply as possible for easy reading. Make sure that the format of the tables is consistent throughout the publication. Use a UNIVERS or HELVETICA typeface for all typeset tables. Computer printout sheets for electrically tabulated data must show clear, black-white contrast and must not contain any grey or broken type or horizontal print bars. The use of a new ribbon is strongly recommended for the preparation of all camera-ready computer printouts.

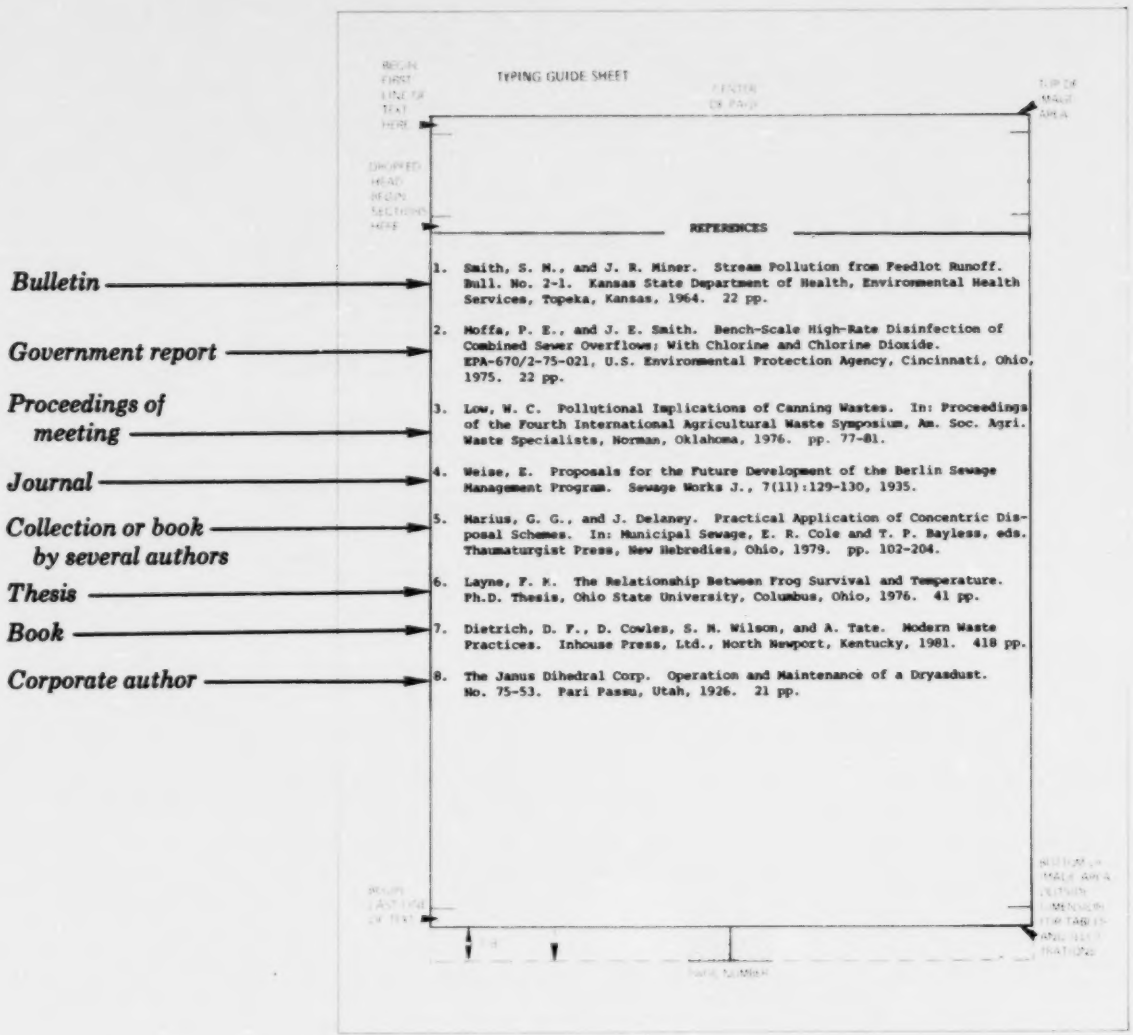
Number tables within the text with consecutive Arabic numerals, preceded by the word "TABLE" (TABLE 1, TABLE 2). Within appendices, include the appendix letter (TABLE A-1, TABLE C-3). Place a descriptive caption above each table after the table number. Type the caption in all caps, without a closing period.

When necessary, place a table broadwise and center within the image area on a page so that the head of the table is to the reader's left, and the bottom of the page is to the reader's right, i.e., will be readable when the page is turned clockwise 90° for normal viewing (see Figure 9, Sample P illustration).

Use symbols for table footnotes, e.g., *, †, ‡, §, #, as available; double their use, if needed. Assign the symbols consecutively, in normal reading order (across the table and from top to bottom). Superscript, lower-case letters may be substituted for symbols if their use will not confuse the reader.

When a long table is continued on two or more pages, note this continuation at the bottom of all but the last page, e.g., (continued). Repeat the table number and "continued," but not the table caption, on all the following pages, e.g., TABLE 4 (continued). Repeat the column headings, with rules, on each page.

Sample Q. Tables.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2. Moffa, P. E., and J. E. Smith. Bench-Scale High-Rate Disinfection of Combined Sewer Overflows; With Chlorine and Chlorine Dioxide. EPA-670/2-75-021, U.S. Environmental Protection Agency, Cincinnati, Ohio, 1975. 22 pp.
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5. Marius, G. G., and J. Delaney. Practical Application of Concentric Disposal Schemes. In: Municipal Sewage, E. R. Cole and T. P. Bayless, eds. Thaumaturgist Press, New Hebredies, Ohio, 1979. pp. 102-204.
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7. Dietrich, D. F., D. Cowles, S. M. Wilson, and A. Tate. Modern Waste Practices. Inhouse Press, Ltd., North Newport, Kentucky, 1981. 418 pp.
8. The Janus Dihedral Corp. Operation and Maintenance of a Dryasdust. No. 75-53. Pari Passu, Utah, 1926. 21 pp.
Bulletin
Government report
Proceedings of meeting
Journal
Collection or book by several authors
Thesis
Book
Corporate author

References concern source material cited in the document. Present this information in an accurate, uniform manner; use a style consistent with that of any reputable scientific or technical journal or society. Take care to include all essential elements of a reference: author(s), title, source, identifying numbers, pages, and date. The examples above illustrate citing references by the "number" system; an example of the "author-year" system is illustrated in Sample S, Bibliography. Either system is acceptable.

To aid in reading from microfilm, a reference should be identified completely at the bottom of the page on which it occurs. When references are numerous, list them in a "References" section of the report. Exercise judgment; the length and complexity of the report may well be the determining factor.

Personal communications are not considered references; if necessary, include them, in parentheses, within the text.

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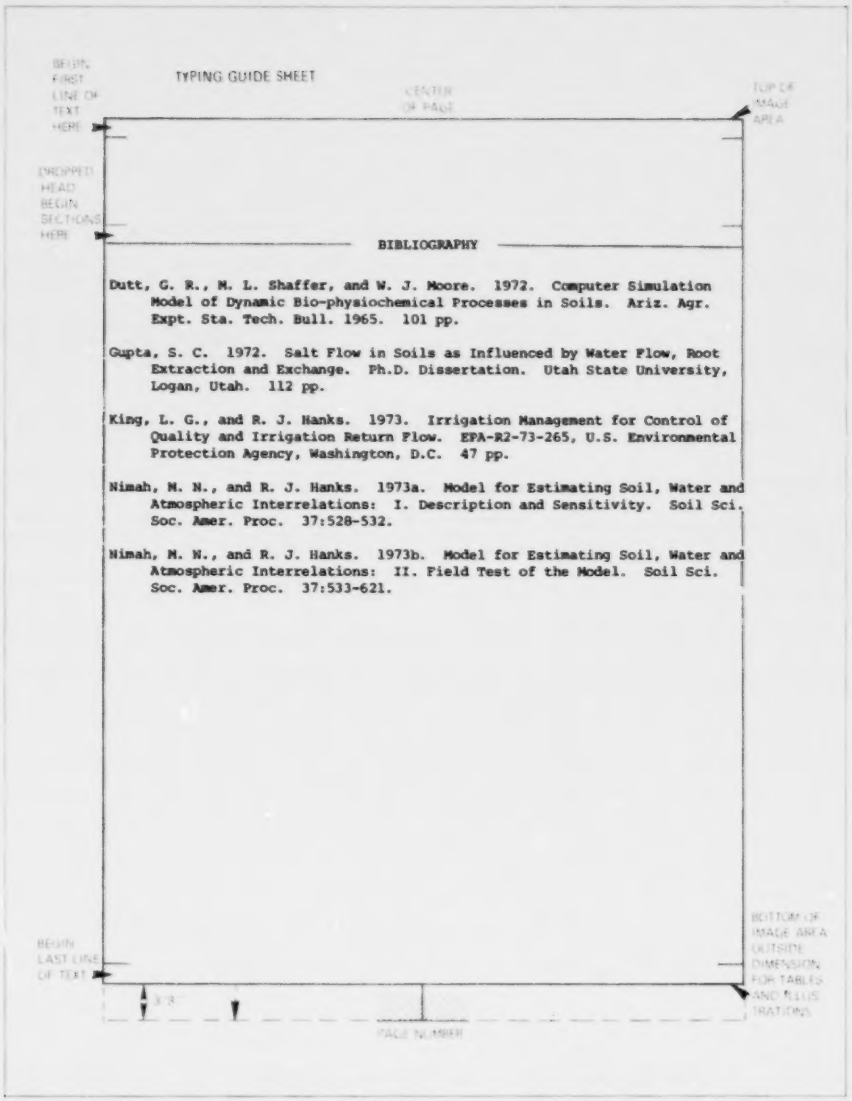
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BIBLIOGRAPHY
Dutt, G. R., M. L. Shaffer, and W. J. Moore. 1972. Computer Simulation Model of Dynamic Bio-physiochemical Processes in Soils. Ariz. Agr. Expt. Sta. Tech. Bull. 1965. 101 pp.
Gupta, S. C. 1972. Salt Flow in Soils as Influenced by Water Flow, Root Extraction and Exchange. Ph.D. Dissertation. Utah State University, Logan, Utah. 112 pp.
King, L. G., and R. J. Hanks. 1973. Irrigation Management for Control of Quality and Irrigation Return Flow. EPA-R2-73-265, U.S. Environmental Protection Agency, Washington, D.C. 47 pp.
Nimah, M. N., and R. J. Hanks. 1973a. Model for Estimating Soil, Water and Atmospheric Interrelations: I. Description and Sensitivity. Soil Sci. Soc. Amer. Proc. 37:528-532.
Nimah, M. N., and R. J. Hanks. 1973b. Model for Estimating Soil, Water and Atmospheric Interrelations: II. Field Test of the Model. Soil Sci. Soc. Amer. Proc. 37:533-621.
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PAGE NUMBER

Bibliographic entries provide supplementary sources for information on the subject of the document. Present this literature, which has not been cited in the text, in an accurate, uniform manner. There are many modes of presenting reference and bibliographic data; two of the many approaches for form and punctuation are illustrated here in Samples R and S.

List bibliographic entries alphabetically by senior author (the examples above illustrate the "name-and-year" system); take care to include all the essential elements of a reference: author(s), title, source, identifying numbers, pages, date. Be sure to use a style consistent with that of any reputable scientific or technical journal or society. Within any one report, have the punctuation, capitalization, abbreviation, etc., of the bibliography agree with that used for the reference section.

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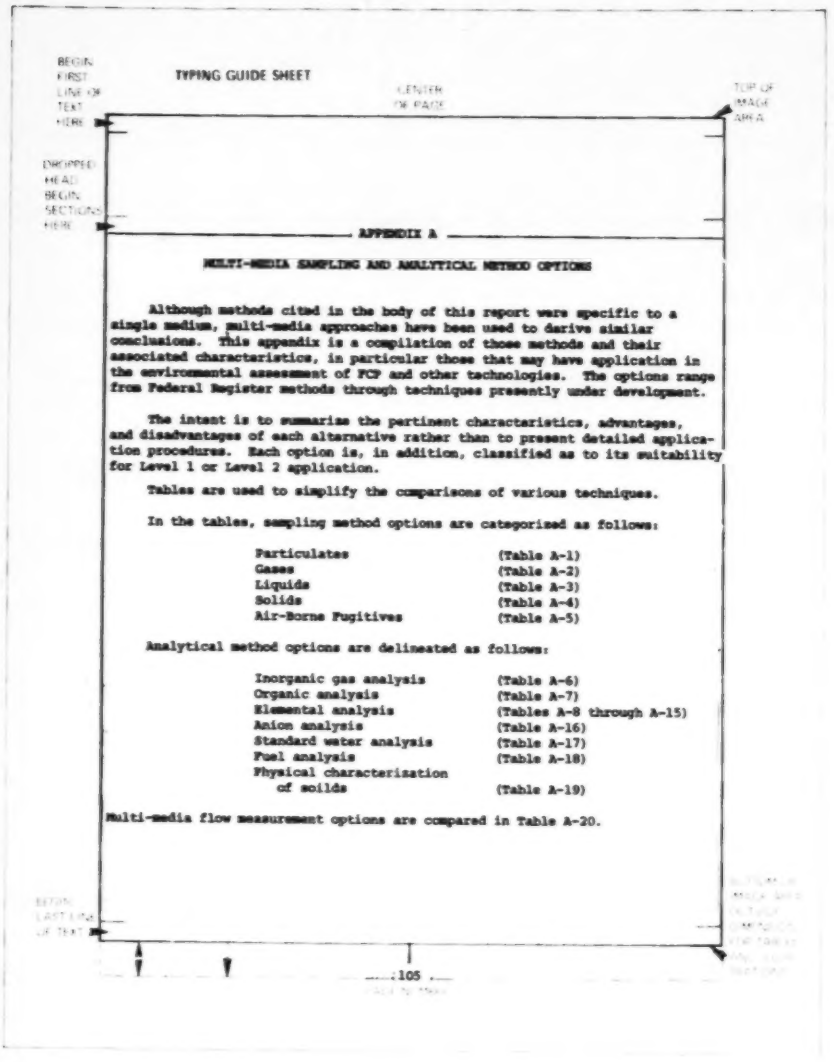
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APPENDIX A
MULTI-MEDIA SAMPLING AND ANALYTICAL METHOD OPTIONS
Although methods cited in the body of this report were specific to a single medium, multi-media approaches have been used to derive similar conclusions. This appendix is a compilation of those methods and their associated characteristics, in particular those that may have application in the environmental assessment of FCP and other technologies. The options range from Federal Register methods through techniques presently under development.
The intent is to summarize the pertinent characteristics, advantages, and disadvantages of each alternative rather than to present detailed application procedures. Each option is, in addition, classified as to its suitability for Level 1 or Level 2 application.
Tables are used to simplify the comparisons of various techniques.
In the tables, sampling method options are categorized as follows:
Particulates (Table A-1)
Gases (Table A-2)
Liquids (Table A-3)
Solids (Table A-4)
Air-Borne Fugitives (Table A-5)
Analytical method options are delineated as follows:
Inorganic gas analysis (Table A-6)
Organic analysis (Table A-7)
Elemental analysis (Tables A-8 through A-15)
Anion analysis (Table A-16)
Standard water analysis (Table A-17)
Fuel analysis (Table A-18)
Physical characterization of soilds (Table A-19)
Multi-media flow measurement options are compared in Table A-20.
105

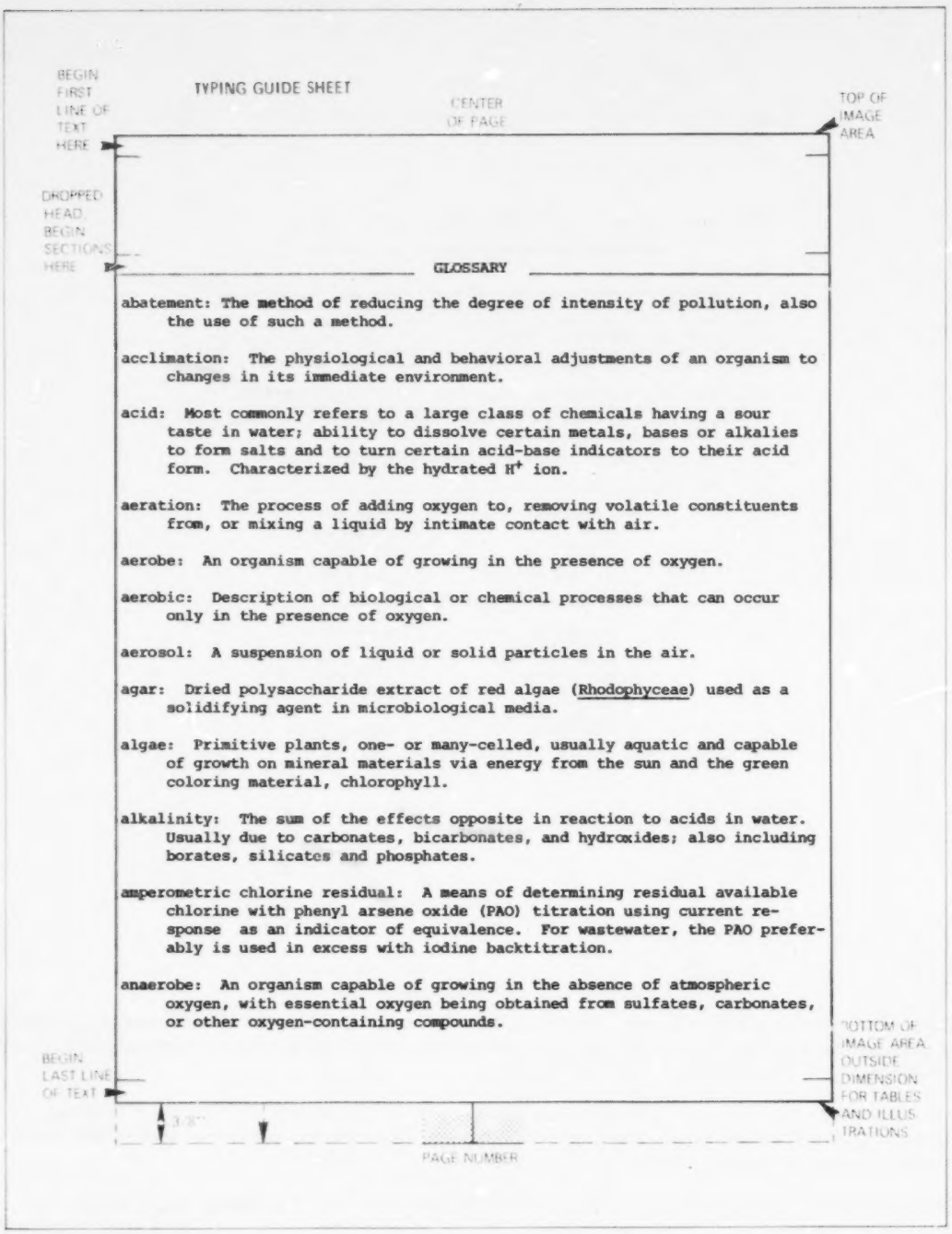
Appendices contain supplementary illustrative material, original data, and quoted matter too lengthy for incorporation in the body of the report or generally relevant but not immediately essential to an understanding of the subject.

The Appendices (or, if there is only one, Appendix) must not be separated from the preceding material by either a titled cover sheet or a divider page. The title and subtitle (if applicable) are to be treated as dropped section heads.

The Appendices may be divided into Appendix A, Appendix B, etc., depending on the kinds and amounts of material used. These divisions should not be arbitrary. There must be a close relationship among materials compiled within any given appendix.

List all Appendices in "Contents" (Sample G) and number all pages consecutively from the body of the report. The folio should *not* show the alphabetical appendix designation.

Sample T. Appendices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GLOSSARY
abatement: The method of reducing the degree of intensity of pollution, also the use of such a method.
acclimation: The physiological and behavioral adjustments of an organism to changes in its immediate environment.
acid: Most commonly refers to a large class of chemicals having a sour taste in water; ability to dissolve certain metals, bases or alkalies to form salts and to turn certain acid-base indicators to their acid form. Characterized by the hydrated H+ ion.
aeration: The process of adding oxygen to, removing volatile constituents from, or mixing a liquid by intimate contact with air.
aerobe: An organism capable of growing in the presence of oxygen.
aerobic: Description of biological or chemical processes that can occur only in the presence of oxygen.
aerosol: A suspension of liquid or solid particles in the air.
agar: Dried polysaccharide extract of red algae (Rhodophyceae) used as a solidifying agent in microbiological media.
algae: Primitive plants, one- or many-celled, usually aquatic and capable of growth on mineral materials via energy from the sun and the green coloring material, chlorophyll.
alkalinity: The sum of the effects opposite in reaction to acids in water. Usually due to carbonates, bicarbonates, and hydroxides; also including borates, silicates and phosphates.
amperometric chlorine residual: A means of determining residual available chlorine with phenyl arsene oxide (PAO) titration using current response as an indicator of equivalence. For wastewater, the PAO preferably is used in excess with iodine backtitration.
anaerobe: An organism capable of growing in the absence of atmospheric oxygen, with essential oxygen being obtained from sulfates, carbonates, or other oxygen-containing compounds.
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Consider the glossary as a partial dictionary where technical or abstruse terms that might not be readily known can be listed and explained. Its need might well depend on the intended audience for the report.

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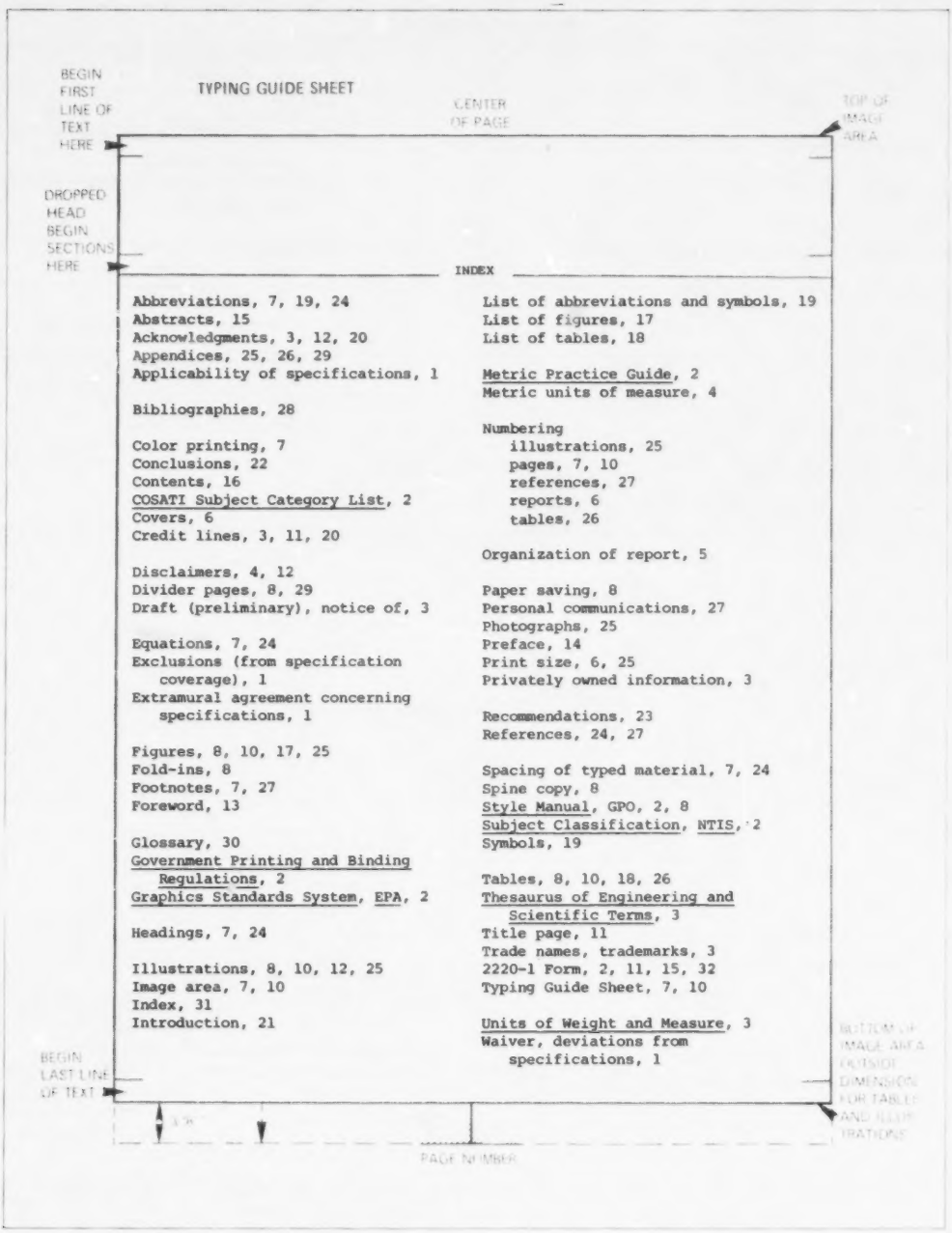

The simple one-page index illustrated above is, in fact, an index for this specification book.

Instructions on indexing can be found in the *CBE Style Manual,* 3d ed., Council of Biology Editors, Committee on Form and Style, 1972 (available from American Institute of Biological Sciences, 3900 Wisconsin Avenue NW, Washington DC 20016) or in *A Manual of Style,* 12th ed., rev., University of Chicago Press, Chicago IL, 1969.

Sample V. Index.

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16. ABSTRACT

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